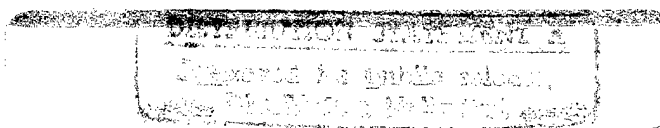


DEPARTMENT OF DEFENSE IN-HOUSE RDT&E ACTIVITIES



FY96

Management Analysis Report



Department of the Army

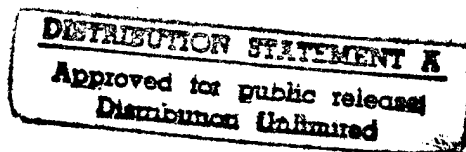
Department of the Navy

Department of the Air Force

DoD Agency (USUHS - AFRRI)

DEPARTMENT OF DEFENSE IN-HOUSE RDT&E ACTIVITIES REPORT

for
Fiscal Year 1996



19970714 036

Prepared for:

The Office of the Secretary of Defense
Director, Defense
Research and Engineering
The Pentagon
Washington, DC 20301

THIS QUALITY INSPECTED 1

FOREWORD

Introduction

The DoD In-House Research, Development, Test & Evaluation (RDT&E) Activities Report was started in the mid-1960s by the Office of Laboratory Management within the Office of the Secretary of Defense, at the request of the then Director of Defense Research and Engineering (DDR&E), Dr. John Foster. The annual report has been produced in official form since 1966.

The DoD In-House RDT&E Activities Report and database project is the DDR&E's central source of information on laboratory status, and serves four essential purposes: (1) since inception, it has been the only compilation of statistics organized by location on DoD RDT&E Activities; (2) it provides the basis for prompt responses to many general queries about DoD RDT&E Activities, without recourse to special surveys, etc.; (3) it provides a historical database which can be utilized for tracing consolidations and organizational changes, and for special analyses and trend studies; and (4) it provides insight into the technical and organizational environment of the DoD Laboratories and the financial manpower and facility investments made in them.

The Office of the Deputy Director of Defense Research and Engineering for Laboratory Management and Technology Transition leads a Steering Group which is responsible for the preparation and oversight of the report and its underlying database. The Steering Group is composed of representatives from the offices of the Director of Defense Research and Engineering, the Director, Test Systems Engineering & Evaluation, the Deputy Assistant Secretary of the Army for Research and Technology, the Chief of Naval Research, the Deputy Assistant Secretary of the Air Force (Science, Technology and Engineering), and the Director of the Armed Forces Radiobiology Research Institute of the Uniformed Services University of the Health Sciences (USUHS). This year the Steering Group and the Science and Technology Business Process Reengineering Office developed an improved data collection process taking advantage of both the existing infrastructure at the activities and utilizing the latest Internet technologies. This improvement initiative has resulted in a more accurate and timely report.

A DoD organizational entity is considered to be a "DoD RDT&E Activity" when it is owned and operated by the Government, and a minimum of 25% of its total effort is devoted to research, exploratory or advanced development, engineering development, demonstration/validation, systems or operational support, or some combination thereof. Examples are a research laboratory; a research, development and engineering center (RDEC), a test center or proving ground, and a multi-functional entity such as a "warfare center." An "In-House" RDT&E Activity is an organization where a minimum of 25% of the in-house manpower and/or 25% of the obligational authority used is devoted to research, exploratory or advanced development, engineering development, etc., conducted in-house.

Structure of Report

Selected data for the In-House RDT&E Activities of the Army, Navy, Air Force and the USUHS are summarized in tables in the first section of the report. Following the tables are individual sections which cover the In-House RDT&E Activities of the three Military Services and USUHS. Each Activity is described in a standard multi-page format.

Activities are listed alphabetically within their respective military departments. A partial organization chart, entitled "Abbreviated Functional Chart - Technical

Organizations", appears for each Activity to provide an overview of its technical operations. Funding data are broken down into the standard RDT&E sub-categories: 6.1 - Research, 6.2 - Exploratory Development, 6.3 - Advanced Development, 6.4 - Demonstration & Validation, 6.5 - Engineering and Manufacturing Development, 6.6 - Management Support, 6.7 - Operational Systems Development, and Non-DoD. All zero-filled report data fields reflect a zero amount reported.

Organizational changes for FY96 appear in Appendix A. Appendix B contains definitions of the data elements displayed in this report. Appendix C defines selected abbreviations and acronyms.

Every effort has been made to provide accurate information. Each submission was reviewed and approved by the head of the reporting Activity. All numbers and statements submitted by each Activity were then thoroughly examined by the members and staff of the Steering Group. Please note, though, that this report does not represent the total DoD RDT&E program. It is also not an accounting or financial management document, but rather a "snapshot" of the operation of the individual Activities contained in the report. All funding data reflect total obligational authority received in FY96. The data in this report should not be summarized or used for detailed comparative analyses, because the Service labs/centers use a number of different business accounting systems to satisfy their special needs. See Appendix B for further explanations.

The report is used by numerous DoD organizations, as well as various committees of Congress, the Library of Congress and the General Accounting Office. The report provides easily accessible comprehensive and accurate information without frequent querying of field Activities.

Added Features

This report can be found in the **DOCUMENTS** section on the DDR&E/LM&TT Web Site at <http://www.dtic.mil/labman/>. Web access to the FY 96 Report has been expanded to include the following:

- An FY96 Report Web Site, based on the hard copy report structure, has been built so that the entire report can be browsed on-line.
- Individual Activity data can be printed by category or as a whole from the Web Site.
- The report data can be downloaded from the Web Site as a Word document, by individual Activity, by Service, or in its entirety. The size of the downloadable files have been reduced from those of previous years by over 80%, significantly speeding up the downloading process.
- The FY 94-96 reports can be searched by Activity and particular category, without having to drill down through site indices.

Distribution

This publication should be given widespread distribution in the DoD Laboratories, both as an internal resources reference document at the Director and Commanding Officer level, and as a catalog of general activity at the bench level. It provides laboratory staff an opportunity to familiarize themselves with the functional capabilities of other DoD Laboratories, thereby encouraging scientists and engineers to communicate with their counterparts at other labs on problems of common interest.

In addition, this publication has proven helpful to those in the private sector interested in exploring the potential for technology cooperation/transfer with DoD Laboratories (for example, Cooperative Research and Development Agreements - CRADAs).



Anita K. Jones
Director, Defense Research and Engineering

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TABLE 1. ARMY RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1996

TABLE 1. ARMY RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1996										
INSTALLATION	FUNDING DATA (MILLIONS \$)				PERSONNEL DATA					
	TOTAL	TOTALS IN-HOUSE	TOTALS RDT&E	IN-HOUSE RDT&E	TOTAL MIL	TOTAL CIV	PHD MIL	PHD CIV	ENG MIL	ENG CIV
Aberdeen Test Center	104.563	70.734	65.542	44.075	129	910	0	5	8	290
Aeromedical Research Laboratory	7.405	7.405	4.949	4.949	59	39	9	7	0	6
Armament RDEC.	660.279	288.550	305.557	162.615	60	3,543	0	79	37	1,806
Army Materiel Systems Analysis Act	41.796	31.048	22.055	20.893	16	370	0	12	8	278
Army Research Laboratory	443.828	178.236	284.429	164.000	66	2,546	8	324	19	1,123
Aviation RDEC	156.575	56.302	114.386	30.949	7	742	0	28	5	433
Aviation Technical Test Center	17.320	17.320	14.780	14.780	44	85	0	0	29	30
CECOM RDEC	616.698	160.472	304.066	108.297	72	2,172	0	72	11	1,335
Cold Regions Resrch & Eng. Lab	33.912	28.248	19.616	15.961	4	301	1	62	3	57
Construction Eng. Research Labs	75.015	41.029	42.651	25.852	2	344	0	55	2	152
Dugway Proving Ground	51.000	30.000	46.000	27.000	29	476	0	25	0	11
Edgewood RDEC	399.224	170.506	199.823	84.561	12	1,094	4	72	8	572
Inst. of Surgical Research	7.938	7.938	7.544	7.544	195	52	23	6	29	18
Med. Rsrch Inst. of Chemical Defense	33.429	18.314	32.195	17.080	51	151	22	33	3	23
Med. Rsrch Inst. of Environ. Medicine	13.196	10.214	9.882	8.118	64	89	20	29	1	28
Med. Rsrch Inst. of Infectious Diseases	24.882	24.882	22.772	22.772	246	202	42	48	5	41
Missile RDEC	523.682	147.651	358.612	74.750	8	1,871	0	56	8	1,262
Natick RDEC	94.348	46.227	82.014	35.925	13	496	0	51	4	296
OPTEC-Test and Experimentation Cmd.	116.800	116.800	59.500	59.500	587	449	0	2	23	61
Redstone Technical Test Center	54.300	54.300	24.978	24.978	0	160	0	1	0	90
Rsrch Inst. for Behav. & Soc. Sciences	28.111	19.405	23.821	17.333	11	189	0	91	7	18
Tank-Automotive RDEC	199.269	87.875	129.091	41.269	13	1,198	0	24	13	646
Topographic Engineering Center	77.616	36.852	58.842	21.557	10	420	0	13	2	247
Walter Reed Army Inst. of Research	68.180	63.836	59.509	56.537	413	426	111	90	48	69
Waterways Experiment Station	264.270	210.802	237.704	191.596	9	1,384	0	192	9	493
White Sands Missile Range	330.517	223.412	285.322	198.435	724	2,288	1	13	8	616
Yuma Proving Ground	127.919	38.096	96.827	19.913	170	740	0	0	0	152

TABLE 2. ARMY RDT&E ACTIVITIES, FACILITY DATA, FY 1996

INSTALLATION	LOCATION	SPACE AND PROPERTY							COST (MILLIONS \$)	
		ACRES	SPACE (THOUSANDS OF SQ FT)			TOTAL	REAL PROP	EQUIP		
			LAB	ADMIN	OTHER					
Aberdeen Test Center	Aberdeen Prov. Gnd, MD	56,707	120,290	138,713	937,406	1,196,409	560,716	208,400		
Aeromedical Research Laboratory	Fort Rucker, AL	44	102,000	26,000	20,000	148,000	11,896	46,592		
Armament RDEC	Picatinny Arsenal, NJ	5,853	1,638,000	1,138,000	1,496,000	4,272,000	253,300	253,500		
Army Materiel Systems Analysis Act.	Aberdeen Prov. Gnd, MD	4	0,000	115,281	17,064	132,345	3,596	7,790		
Army Research Laboratory	Adelphi, MD	1,758	1,498,000	536,000	125,000	2,159,000	601,000	500,000		
Aviation RDEC	St. Louis, MO	0	108,852	64,741	14,730	188,323	6,652	27,796		
Aviation Technical Test Center	Fort Rucker, AL	11,025	0,000	98,125	233,000	331,125	3,600	139,436		
CECOM RDEC	Ft. Monmouth, NJ	2,299	421,400	361,900	16,900	800,200	65,600	260,236		
Cold Regions Resrch & Eng. Lab	Hanover, NH	207	242,200	2,400	66,400	311,000	34,600	2,200		
Construction Eng. Research Labs	Champaign, IL	33	118,896	55,882	29,081	203,859	0,000	16,917		
Dugway Proving Ground	Dugway, UT	798,855	123,000	178,000	2,177,000	2,478,000	149,000	8,000		
Edgewood RDEC	Aberdeen Prov. Gnd, MD	0	754,000	329,000	473,000	1,556,000	89,000	137,865		
Inst. of Surgical Research	Fort Sam Houston, TX	1	73,850	11,000	50,300	135,150	13,000	13,000		
Med. Rsrch Inst. of Chemical Defense	Aberdeen Prov. Gnd, MD	30	37,419	38,433	125,024	200,876	23,400	0,032		
Med. Rsrch Inst. of Environ. Medicine	Natick, MA	1	93,676	10,869	9,423	113,968	25,505	30,947		
Med. Rsrch Inst. of Infectious Diseases	Fort Detrick, MD	150	121,000	78,000	148,000	347,000	23,962	42,578		
Missile RDEC	Redstone Arsenal, AL	4,000	944,069	237,330	143,587	1,324,986	220,152	338,843		
Natick RDEC	Natick, MA	58	174,846	184,465	55,097	414,408	18,600	2,200		
OPTEC-Test and Experimentation Cmd	Fort Hood, TX	22	19,900	41,000	0,000	60,900	6,300	3,000		
Redstone Technical Test Center	Redstone Arsenal, AL	14,000	460,000	52,000	133,000	645,000	146,000	0,000		
Rsrch Inst. for Behav. & Soc. Sciences	Alexandria, VA	0	20,700	66,200	11,400	98,300	15,000	17,000		
Tank-Automotive RDEC	Warren, MI	105	457,050	123,959	57,564	638,573	115,500	222,211		
Topographic Engineering Center	Alexandria, VA	0	88,776	35,081	53,134	176,991	22,400	23,828		
Walter Reed Army Inst. of Research	Washington, DC	0	403,544	178,372	151,472	733,388	16,460	64,311		
Waterways Experiment Station	Vicksburg, MS	2705	2,555,940	234,240	48,330	2,838,510	486,000	530,000		
White Sands Missile Range	White Sands Missile, NM	2,310,798	1,869,600	957,500	1,530,600	4,357,700	509,100	541,100		
Yuma Proving Ground	Yuma, AZ	1,009,352	28,200	153,300	1,972,500	2,154,000	141,300	228,655		

TABLE 3. NAVY RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1996

TABLE 3. NAVY RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1996										
INSTALLATION	FUNDING DATA (MILLIONS \$)				PERSONNEL DATA					
	TOTAL	TOTALS IN-HOUSE	TOTALS RDT&E	IN-HOUSE RDT&E	TOTAL MIL	TOTAL CIV	PHD MIL	PHD CIV	ENG MIL	ENG CIV
Naval Aerospace Medical Research Lab	4.145	3.66	4.145	3.660	29	36	9	6	7	4
Naval Air Warfare Center	4,199.419	1,526.291	1,284.487	572.924	3,020	17,315	1	241	208	6,306
Naval Biodynamics Laboratory	1.208	1.208	1.208	1.208	4	14	1	2	0	3
Navy Clothing & Textile Resrch. Facility	6.643	3.088	2.723	1.451	1	47	0	1	1	32
Naval Cmd, Control & Ocean Surv. Ctr.	1,622.446	566.869	497.877	181.437	336	5,458	2	196	63	2,249
Naval Dental Research Institute	1.552	1.461	1.414	1.323	24	11	10	4	0	2
Naval Facilities Engineering Service Ctr.	133.550	98.211	27.972	25.966	12	557	0	22	12	325
Naval Health Research Center	12.111	4.857	10.355	4.130	21	64	7	13	4	27
Naval Medical Research Institute	66.599	28.502	49.363	16.237	226	190	54	30	17	51
Naval Medical Research Unit # 2	5.343	5.200	4.331	4.188	20	98	9	10	3	40
Naval Medical Research Unit # 3	5.200	5.200	4.900	4.900	31	166	10	20	1	44
Navy Personnel Rsrch & Dev. Ctr.	25.689	11.698	14.686	7.192	14	129	0	31	6	57
Naval Research Laboratory	767.800	359.300	614.100	301.000	186	3,310	7	850	11	888
Naval Submarine Medical Research Lab	3.804	3.804	3.664	3.664	22	35	8	9	0	5
Naval Surface Warfare Center	2,706.300	1,480.300	974.600	543.500	473	16,404	1	376	30	6,817
Naval Undersea Warfare Center	915.800	483.100	315.000	171.200	221	5,493	1	154	28	2,652

TABLE 4. NAVY RDT&E ACTIVITIES, FACILITY DATA, FY 1996

TABLE 4. NAVY RDT&E ACTIVITIES, FACILITY DATA, FY 1996								
INSTALLATION	LOCATION	SPACE AND PROPERTY						
		ACRES	SPACE (THOUSANDS OF SQUARE FEET)			COST (MILLIONS \$)		
			LAB	ADMIN	OTHER	TOTAL	REAL PROP	EQUIP
Naval Aerospace Medical Rsrch Lab	Pensacola, FL	3	102.936	6.648	10.237	119.821	12.838	11.076
Naval Air Warfare Center	Arlington, VA	1,153,915	7,410.937	3,277.501	16,002.848	26,691.286	1,328.399	1,057.495
Naval Biodynamics Laboratory	New Orleans, LA	2	25.845	27.907	0.000	53.752	2.263	4.727
Navy Clothing & Textile Rsrch Fac.	Natick, MA	0	12.667	16.000	5.630	34.297	9.078	2.111
Naval Cmd, Contrl & Ocean Surv. Ctr.	San Diego, CA	2,799	2,238.547	1,078.092	1,999.747	5,316.386	126.400	209.000
Naval Dental Research Institute	Great Lakes, IL	0	21.264	6.001	9.318	36.583	5.000	2.183
Naval Facilities Eng. Service Ctr.	Port Hueneme, CA	10	68.000	84.000	35.000	187.000	30.000	8.700
Naval Health Research Center	San Diego, CA	0	32.330	12.250	2.200	46.780	0.000	1.657
Naval Medical Research Institute	Bethesda, MD	7	161.930	63.875	0.000	225.805	8.700	22.620
Naval Medical Research Unit # 2	Jakarta, Indonesia	0	15.132	11.797	22.330	49.259	1.878	1.989
Naval Medical Research Unit # 3	Cairo, Egypt	4	68.200	9.100	71.300	148.600	10.600	4.900
Navy Personnel Rsrch & Dev. Ctr.	San Diego, CA	3	55.800	16.400	4.500	76.700	1.170	8.659
Naval Research Laboratory	Washington, DC	556	3,199.000	230.000	422.000	3,851.000	190.000	455.000
Naval Submarine Medical Rsrch Lab	Groton, CT	0	44.783	6.233	4.962	55.978	7.657	4.936
Naval Surface Warfare Center	Arlington, VA	72,521	6,561.000	1,710.000	12,283.000	20,554.000	1,107.800	1,030.700
Naval Undersea Warfare Center	Newport, RI	3,263	3,321.000	189.000	2,090.000	5,600.000	284.551	571.000

TABLE 5. AIR FORCE RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1996

INSTALLATION	FUNDING DATA (MILLIONS \$)			PERSONNEL DATA						
	TOTAL	TOTALS IN-HOUSE	TOTALS RDT&E	IN-HOUSE RDT&E	TOTAL MIL	TOTAL CIV	PHD MIL	PHD CIV	ENG MIL	ENG CIV
Armstrong Laboratory	209.100	51.500	180.500	48.000	738	812	97	139	189	167
Arnold Engineering Development Ctr	299.511	268.668	289.358	258.659	111	175	0	4	23	62
Development Test Center	542.280	266.460	478.230	228.580	4,474	2,376	0	6	59	433
Flight Test Center	606.457	258.173	554.214	240.509	4,233	2,378	42	5	166	538
Phillips Laboratory	612.307	111.168	452.560	93.966	558	1180	45	229	279	341
Rome Laboratory	484.100	104.837	368.690	84.688	128	936	7	79	66	408
Wright Laboratory	1,083.000	208.000	1,043.700	208.000	384	2,123	45	217	246	1,171

TABLE 6. AIR FORCE RDT&E ACTIVITIES, FACILITY DATA, FY 1996

INSTALLATION	LOCATION	SPACE AND PROPERTY						
		SPACE (THOUSANDS OF SQUARE FEET)				COST (MILLIONS \$)		
		ACRES	LAB	ADMIN	OTHER	TOTAL	REAL PROP	EQUIP
Armstrong Laboratory	Brooks AFB, TX	96	1,034.000	157.000	1.000	1,192.000	64.860	74.116
Arnold Engineering Development Ctr	Arnold AFB, TN	39,081	1,089.000	374.000	1,231.000	2,694.000	1,331.000	235.460
Development Test Center	Eglin AFB, FL	463,115	1,801.631	829.156	12,613.444	15,244.227	687.176	409.690
Flight Test Center	Edwards AFB, CA	301,482	297.000	315.000	8,980.000	9,592.000	768.624	307.000
Phillips Laboratory	Kirtland AFB, NM	16,620	996.000	652.000	864.000	2,512.000	1,051.200	1,109.500
Rome Laboratory	Rome, NY	1,616	825.000	236.000	438.000	1,499.000	65.000	119.162
Wright Laboratory	WPAFB, OH	1,240	1,281.078	614.009	690.976	2,586.063	983.000	2,095.190

TABLE 7. USUHS RDT&E ACTIVITIES, PROGRAM AND PERSONNEL DATA, FY 1996											
INSTALLATION	FUNDING DATA (MILLIONS \$)				PERSONNEL DATA						
	TOTAL	TOTALS IN-HOUSE	TOTALS RDT&E	IN-HOUSE RDT&E	TOTAL MIL	TOTAL CIV	PHD MIL	PHD CIV	ENG MIL	ENG CIV	
Armed Forces Radiobiology Rsrch Inst.	12.449	12.236	11.049	10.836	56	101	14	28	26	26	

TABLE 8. USUHS RDT&E ACTIVITIES, FACILITY DATA, FY 1996									
INSTALLATION	LOCATION	SPACE AND PROPERTY							
		ACRES	SPACE (THOUSANDS OF SQUARE FEET)			COST (MILLIONS \$)			
			LAB	ADMIN	OTHER	TOTAL	REAL PROP	EQUIP	
Armed Forces Radiobiology Rsrch Inst.	Bethesda, MD	10	61.750	34.257	23.908	119.915	15.000	13.000	

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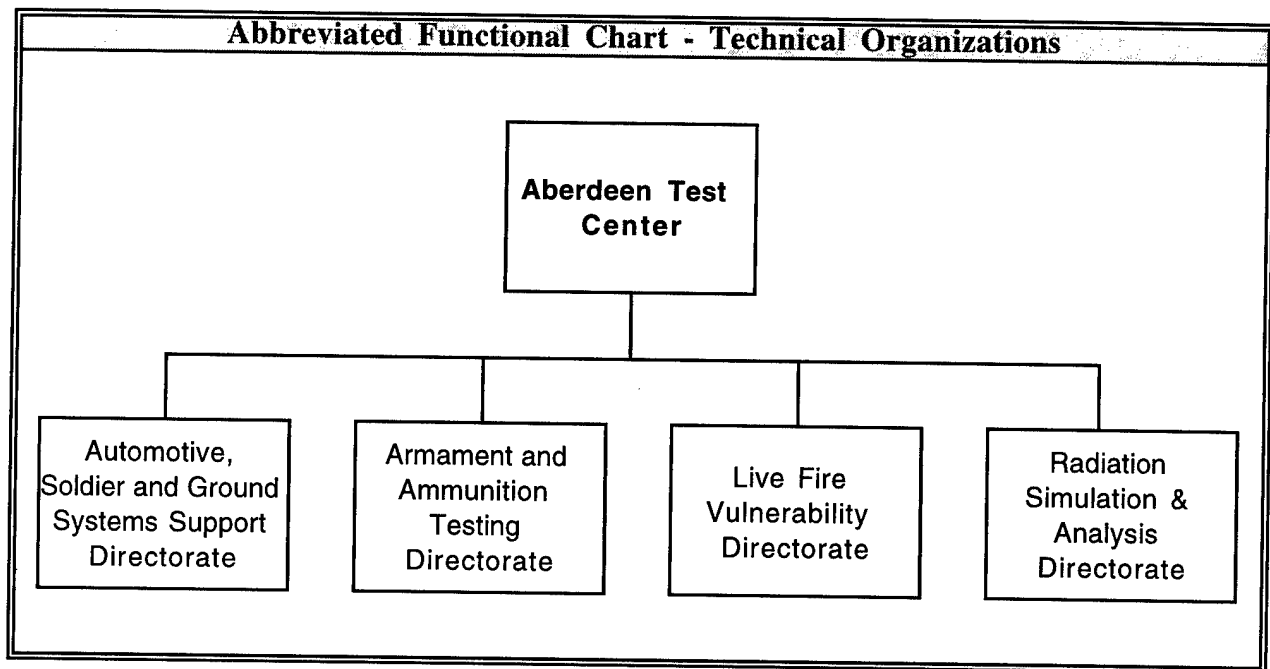
DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY

The Army's twenty-seven (27) In-House RDT&E Activities are:

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Aeromedical Research Laboratory	2-6
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Aberdeen Test Center



Aberdeen Test Center

Aberdeen Proving Grd, MD 21005-5059
(410) 278-3574

Commander: Colonel Richard O. Bailer
Technical Dir.: James W. Fasig

MISSION

Aberdeen Test Center is the most diverse test facility within DoD, testing a broad spectrum of military weapons systems and equipment including armored vehicles, guns, ammunition, trucks, bridges, generators, night vision devices, individual equipment (boots, uniforms, helmets, etc), and surface and underwater marine systems. As a multi-purpose proving ground, with a temperate climate, our primary mission is to plan, conduct, analyze and report on projects supporting research, development, test and evaluation (RDT&E), design, engineering, production, and surveillance tests for DoD and other government agencies, contractors, foreign governments, and private industry. In this single location, ATC can subject an item to a full range of tests from automotive endurance and full weapons performance with environmental extremes, to full-scale live fire vulnerability/survivability/lethality testing utilizing an extensive array of test ranges/facilities, simulators and models. In addition to testing domestic systems, we exploit foreign systems to assess the enemy threat. We also develop state-of-the-art test procedures (DoD, international), methodologies and instrumentation in order to meet the test requirements of advancing military technologies.

CURRENT IMPORTANT PROGRAMS

Armored Gun System
Tank Gun Mount Trunion Bearing Test
M1A2 Abrams Upgrade Tank
Halon Substitutes for Automatic Fire Extinguishing Systems
M829A2 Cartridge, 120MM
Family of Medium Tactical Vehicles (FMTV)

Technology Transfer Efforts:

Federal Highways Admin/MD State Police/ATC - Partnership for development of hardware & software resulting in two prototype systems supporting the National Aggressive Driver Program (ITS primary initiative).

AV Technologies/Crosby International/ATC - Joint effort required to promote a test and training initiative for the successful fielding and commercialization of the PANDUR wheeled vehicle.

TVI/UofMD/ATC - Joint effort required to test shelter system components supporting a candidate State of Maryland FED/MIPS program.

National Automated Highway System Consortium (NAHSC) - Participating as an associate member for the test & manufacture of Intelligent Transportation System Technologies. Two areas of concentration include: support in the development of safety subsystems through consultation and program management support of the scheduled National demonstration. Also attended each stakeholder meeting (Boston, Minneapolis).

SAE Symposium in Detroit - Participation in the ITS technical sessions to build foundation for technology exchange.

CURRENT IMPORTANT PROGRAMS (continued)

Southern Coalition for Advanced Transportation (SCAT) - Host annual spring meeting, serving as a member of this National Consortium. Detailed display of current capabilities.

Maryland Environmental Demonstration Technology Center (MEDC) - Formulation of a Statewide coalition serving as a platform for environmental technology testing, demonstrations and commercialization.

ITS America Symposium and Technical Sessions in Houston - Participation in the Stakeholder meeting for the formulation of procedures, adaptations and integrations of advanced transportation systems. Participation in trucking and federal participant forums.

EQUIPMENT/FACILITIES

World-renowned automotive test/obstacle courses; numerous interior and exterior firing ranges; environmental simulation capabilities including rough-handling and vibration, electromagnetic interference and environmental conditioning capabilities; full transportability test capability to include rail, roadability, MIL-STD 209 pull and tie-down, internal and external air transport; Underwater Explosion test ponds and Depleted Uranium Containment Fixture (Superbox) for live fire vulnerability and lethality testing; sophisticated non-destructive test facilities; robotics test facilities; pulse radiation facility; Firing Impulse Simulator; state-of-the-art industrial complex which includes maintenance and experimental fabrication capabilities.

Aberdeen Test CenterAberdeen Proving Grd, MD 21005-5059
(410) 278-3574Commander: Colonel Richard O. Bailer
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FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.359	0.178	0.537
6.2	1.795	0.894	2.689
6.3	3.949	1.966	5.915
Subtotal (S&T)	6.103	3.038	9.141
6.4	0.000	0.000	0.000
6.5	6.823	3.395	10.218
6.6	30.072	14.498	44.570
6.7	0.000	0.000	0.000
Non-DOD	1.077	0.536	1.613
TOTAL RDT&E	44.075	21.467	65.542
Procurement	12.838	5.341	18.179
Operations & Maintenance	2.741	1.411	4.152
Other	11.080	5.610	16.690
TOTAL FUNDING	70.734	33.829	104.563

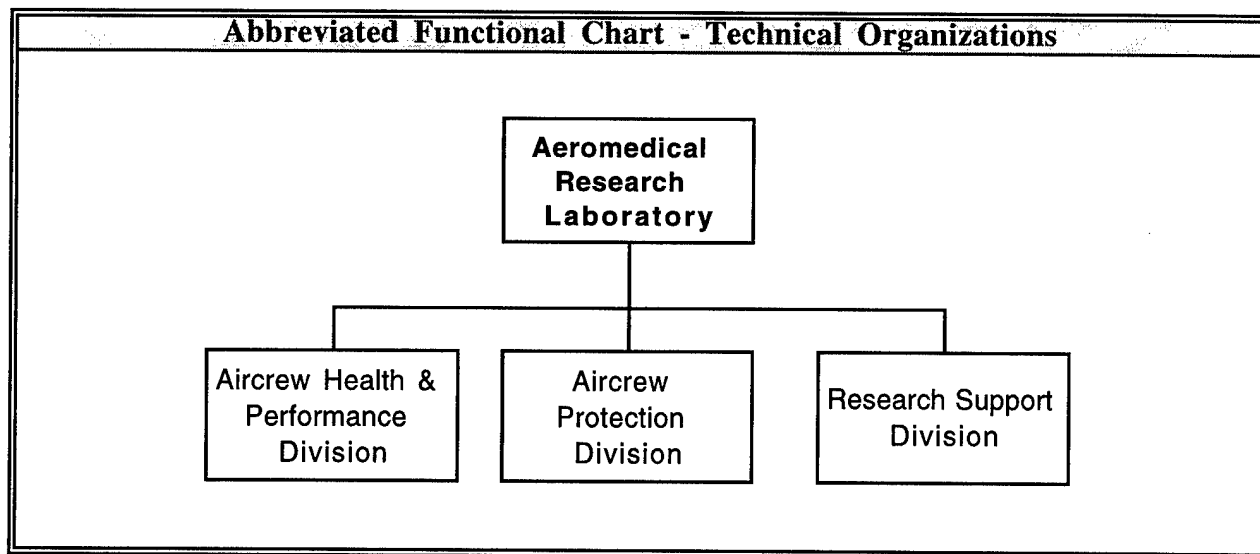
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	8	121	129
CIVILIAN	5	290	615	910
TOTAL	5	298	736	1,039

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	120.290	REAL PROPERTY	560.716
ADMIN	138.713	* NEW CAPITAL EQUIPMENT	.016
OTHER	937.406	EQUIPMENT	208.400
TOTAL	1,196.409	* NEW SCIENTIFIC & ENG. EQUIP.	15.768
ACRES	56,707	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Aeromedical Research Laboratory



Aeromedical Research Laboratory
Fort Rucker, AL 36362-0577
(334) 255-6917

Commander: COL Dennis F. Shanahan
Deputy Cdr: LTC (P) Clyde D. Byrne

MISSION

Conducts medical research related to the effects of military aviation, combat vehicles, and other weapons systems on soldier health and performance. Conducts research on the impact of continuous operations on crew performance, on health hazards of emerging military materiel systems and develops design criteria for aviator protective equipment and visual systems.

CURRENT IMPORTANT PROGRAMS

- Aviator Performance Effects of Sustained Operations, Sleep Cycle Disruption and Extended Use of Night Vision Devices
- Aviator Tolerance to Head Supported Mass
- Visual Performance with Flat Panel Displays
- Soldier Tolerance to Biomechanical Impact and Prevention of Impact Injury

3 COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS (CRDA's)

DESCRIPTION:

- Advanced Active Noise Reduction, Active Noise Cancellation (ANR/ANC) for Aviation Headsets and Microphones
- Research and Development on Advanced Aircrew Protection Systems
- Research, Development, Test and Evaluation of Aeromedical Evacuation Equipment

EQUIPMENT/FACILITIES

Multi-Axis Ride Simulation System; Helmet Drop Test Tower and Impact Facility; Variable Center of Gravity Helmet Device; Head and Neck Inertial Loading Sled; Mass Properties (Center of Mass Location & Mass Moments of Inertia) Measurement System; Biochemistry Lab; UH-60 Aeromedical Research Flight Simulator; Helicopter Inflight Monitoring System; Modified Aircraft for Inflight Medical Research; Data Acquisition and Biotelemetry System - In-House/Mobile; High Intensity Impulse Noise Generator (Shock Tube); Mobile Acoustics Lab; Anechoic and Reverberation Chambers; Bio-Optical Testing Lab; Optical Fabrication Lab; Electro-Optical Testing Lab; Mobile Visual Displays Lab; Scientific and Medical Research Information Center; MEDEVAC Equipment Testing Facility; and Aviation Epidemiology Data Register.

Aeromedical Research Laboratory
Fort Rucker, AL 36362-0577
(334) 255-6917

Commander: COL Dennis F. Shanahan
Deputy Cdr: LTC (P) Clyde D. Byrne

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.045	N/A	0.045
6.1 Other	0.312	0.000	0.312
6.2	4.484	0.000	4.484
6.3	0.015	0.000	0.015
Subtotal (S&T)	4.856	0.000	4.856
6.4	0.032	0.000	0.032
6.5	0.010	0.000	0.010
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.051	0.000	0.051
TOTAL RDT&E	4.949	0.000	4.949
Procurement	0.319	0.000	0.319
Operations & Maintenance	0.037	0.000	0.037
Other	2.100	0.000	2.100
TOTAL FUNDING	7.405	0.000	7.405

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

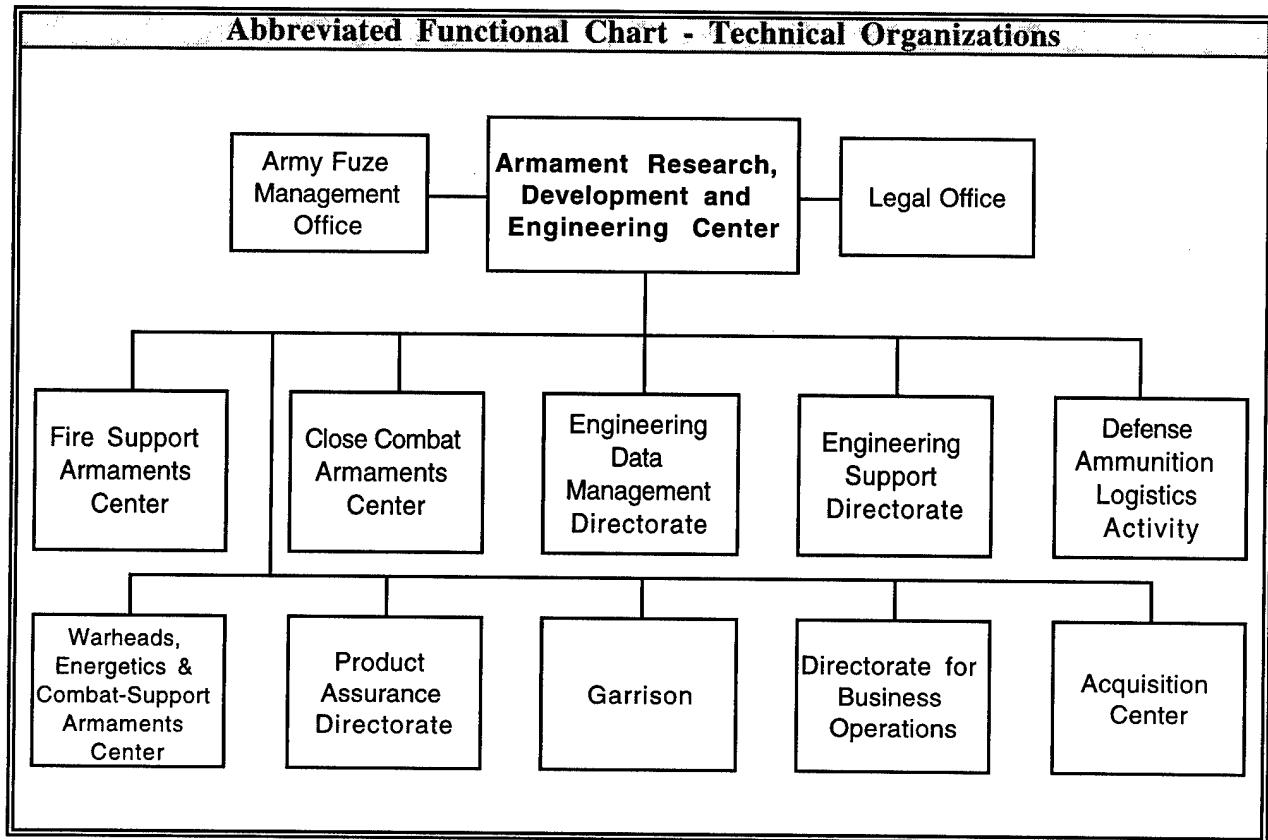
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	9	0	50	59
CIVILIAN	7	6	26	39
TOTAL	16	6	76	98

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	102.000	REAL PROPERTY	11.896
ADMIN	26.000	* NEW CAPITAL EQUIPMENT	1.032
OTHER	20.000	EQUIPMENT	46.592
TOTAL	148.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.600
ACRES	44	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Armament Research, Development and Engineering Center



Armament Research, Development and Engineering Center

Picatinny Arsenal, NJ 07806-5000
(201) 724-6000

Commander: BG James W. Boddie, Jr.
Technical Dir: Mr. Carmine Spinelli

MISSION

TACOM-ARDEC is a business center of the Tank-automotive & Armaments Command (TACOM), a major subordinate command of the U.S. Army Materiel Command (AMC). TACOM-ARDEC provides the United States military with the firepower to achieve decisive battlefield victory. Our mission is to conduct or manage research, development and life cycle engineering, including product assurance engineering for ammunition, weapons, fire control and associated items. This includes engineering support for production and integrated logistics support. We provide procurement and management of initial production quantities and technical support to soldiers and equipment in the field by maintaining a technology base. TACOM-ARDEC is also the Army executive agent for research and development for pollution prevention.

The primary function of TACOM-ARDEC will continue to be the smart buyer for armaments. TACOM-ARDEC currently retains the technical knowledge and expertise for current, historical and future experimental and developmental ammunition and weapon systems, many of which have no counterpart in industry. This knowledge base allows TACOM-ARDEC to insure that the government does not waste time and money on efforts that have historically proven not to work. In order to develop and maintain this knowledge base, TACOM-ARDEC is active in all phases of the life cycle process. TACOM-ARDEC performs unbiased system analyses that consider a diverse number of systems and technologies, both in-house and contractor developed, resulting in the best technical approach and best buy decisions. TACOM-ARDEC also performs unbiased technical assessments of the current state-of-the-art in ammunition and weapon systems that points the way to future developmental programs and technology transfer to industry.

CURRENT IMPORTANT PROGRAMS

Our core business areas and corresponding technical initiatives are:

SMART MUNITIONS: To develop self-contained munitions for all mission areas with the ability to autonomously sense, engage, and kill a target.

INDIRECT FIRE: To maximize defeat of enemy personnel and vehicular targets by developing advanced artillery and mortars with extended range and accuracy. We will achieve autonomous operations, increase range, increase rate of fire, and reduce manpower requirements over current fielded systems.

DIRECT FIRE: To develop weapons and munitions which will defeat the most advanced enemy armor through increased frontal penetration, higher hit probabilities, and enhanced top attack capabilities, while reducing crew size and stress.

SOLDIER WEAPONS: To upgrade armaments for light infantry and special operation forces (SOF), and to develop advanced small caliber weapons that will significantly increase kill capability, enhance survivability and improve the capability to destroy hard targets, and to develop non-lethal weapons for low intensity/ peacekeeping missions.

MINES & DEMOLITIONS: To defeat advanced helicopters, vehicles & personnel with highly intelligent mine-fields, with features such as wide area destruction, complete user control, and Identification Friend or Foe (IFF) capability.

GUN PROPULSION: To develop advanced propulsion mechanisms (including liquid propellant and electromagnetic / electro-thermal), and improve conventional gun propulsion technologies by

CURRENT IMPORTANT PROGRAMS (continued)

increasing projectile weight, velocity, accuracy, and range while decreasing the soldier's logistics burden.

FUZING & LETHAL MECHANISMS: To greatly increase the lethality of armament materiel by focusing on advanced chemical energy warheads (shaped charge and explosively formed penetrators), kinetic energy (KE) penetrators, associated warhead materials, and low collateral damage munitions. Also, to create fuzes with integrated sensors, signal processing, and guidance and control; capable of performing target/clutter discrimination and having multi-option capability for compatibility with autoloaders, and containing electronic safe and arm (S&A) functions.

FIRE CONTROL: To provide life cycle engineering and management of fire control subsystems, software, command, control, and communications; test, maintenance and diagnostic equipment and training devices utilizing an integration of sensors, computers, advanced controls and artificial intelligence aids for a rapid response to command orders of engagement.

MUNITIONS SURVIVABILITY: Munitions Survivability is a comprehensive approach to insure the survivability of the CINCs' critical warfighting assets. It consists of three primary pillars; proposed Munitions Logistics Advanced Concept Demonstration (MLS-ACD), proposed Munitions Survivability Integration Program (MSIP) and the Hazards of Electromagnetic Radiation to Ordnance (HERO) Certification Program. THE MLS-ACD consists of five projects (airborne secured area survivability and clearance, seaport survivability and clearance and emergency resupply). The MSIP will provide "built in" survivability improvements that will help preclude destructive reactions within logistics nodes, transportation assets and combat vehicles using proven/available technologies. The HERO effort assesses the susceptibility of high priority munitions to electromagnetic hazards. The MSP is Joint and is keyed to needs identified in the Defense Planning Guidance (DPG).

TACOM-ARDEC is the Army agent for pollution prevention R&D, providing the Army with technical management for pollution prevention R&D, integration of pollution prevention concerns into the weapons system R&D process, and technical assistance and integration expertise to the Army, other government agencies, and industry

Additionally, some of our key strategic initiatives are:

- Mortar Systems. We will provide both a 120 mm, track mounted and an 81 mm HMMWV mounted mortar system. Both will have digitized fire control and advanced navigation systems which will enhance the lethality, survivability and responsiveness of the mortars.

- Light Weight 155 mm Howitzer. The Advanced Towed Cannon Artillery System (ATCAS) will be a lighter towed howitzer with digital fire control and advanced navigation systems. It will replace our current light division general support artillery system - the M198. The ATCAS provides improvements in lethality, survivability and responsiveness.

- Low Cost Competent Munitions (LCCM). LCCM is an artillery fuze concept which will provide a low cost guidance capability for the existing stockpile of 155 mm projectiles as well as for future projectiles. LCCM greatly improves the accuracy of cannon artillery at extended ranges. LCCM will enhance the lethality and responsiveness of indirect fires, and ease the ammunition logistics burden.

- Intelligent Mine Field (IMF). IMF is a system of Wide Area Mines, acoustic sensors, and command and control devices that can autonomously implement obstacle intent to hunt and kill moving armored vehicles. It enhances survivability and lethality, and will reduce the logistical burden associated with transporting large numbers of conventional mines.

- Extended Range Artillery Projectile (XM982). The XM982 is a 155 mm, DPICM extended range artillery projectile. It will allow current cannon systems to deliver 85 improved submunitions out to a range of 37 km. It is an innovative design that combines base bleed and rocket assist technologies. It

CURRENT IMPORTANT PROGRAMS (continued)

enhances the lethality and survivability of the force.

- 105 mm Smart Munition. The 105 mm Smart Munition concept is a cannon delivered, fire and forget or laser designated, armor defeating munition. It gives the light force the capability to defeat armor targets out to 15 km, and with the laser designator option, allows commanders to attack point targets (bunkers, command posts, specific structures in built up areas) with precision. The Early Entry Lethality and Survivability Battle Lab 2K study concluded that the 105 mm Smart Munition significantly enhanced the lethality and survivability of the force, while not adding to the strategic lift requirements of the force. This concept will leverage technologies demonstrated in the existing Precision Guided Mortar Munition program.

- Advanced Sensor Submunition Technology (ASST). ASST will be a rocket or missile delivered submunition that will detect, classify, maneuver and attack moving armor targets. It combines three types of sensors: infra red, millimeter wave and laser radar. It will match the best kill mechanism to the target type by using a selectable explosively formed penetrator warhead. ASST will have an "identification friend or foe" capability.

- Objective Individual Combat Weapon (OICW). OICW will be a light weight weapon capable of firing kinetic energy projectiles and an air-bursting fragmentation munition. It will allow soldiers to effectively attack targets at greater ranges, and to attack targets in defilade. It combines leading edge technologies in miniaturized fuzing; integrated fire control; light weight, high strength materials; and munitions effects. OICW will increase the lethality and survivability of the individual soldier. It is the sole lethality component of the Dismounted Battle Lab's 21st Century Land Warrior (21 CLW) Top Level Demonstration.

- Less than Lethal Defeat Mechanisms. TACOM-ARDEC has taken a leading role in the development of Nonlethal Technologies. With increasing emphasis on peacekeeping, low-intensity conflict and humanitarian missions, it becomes important to devise weapons which restrain or immobilize. To this end, TACOM-ARDEC is developing weapons such as: sponge grenades (co-developed with ARL), which are designed to knock the wind out of a person without imparting serious injury; acoustic weapons, which project sound waves, causing nausea and disorientation; sting nets, which envelop a foe and deliver a nonlethal electrical shock to discourage struggle; laser and other directed energy munitions, which are designed to degrade vehicle sensors; and radio frequency and electromagnetic pulse weapons, which could be utilized against enemy equipment in order to disrupt their electronics. Many of these technologies serve as dual-use applications for use in riot-control and civil disturbance situations.

- The Autonomous Intelligent Submunition (AIS) represents a major leap forward in sensors for force-multiplying systems. AIS increases smart submunition effectiveness against a wide variety of targets using breakthroughs in sensors and onboard computer software. Weapon system enhancements include intelligent target prioritization, selectable warheads and increased sensor footprint capabilities. The system concept that would use AIS combines high resolution infrared and millimeter-wave sensors with high-speed computing power and a steerable parafoil to find, prioritize and destroy armored vehicles, missile launch sites and a multitude of other militarily significant targets. The AIS lethal mechanism would be a multi-mode EFP which attacks the chosen target (with a target-specific effect) from above as the submunition loiters and descends over the general target area, while its advanced sensors and steerable parafoil permit the system to intelligently search a wide area for the most desirable target.

CURRENT IMPORTANT PROGRAMS (continued)

- Cased Telescoped Ammunition and Gun Technology (CTAGT) is an innovative means of improving the packaging and design of conventional medium caliber ammunition. This concept combines improved propellants with dimensionally compressed ammunition to improve volumetric efficiency. Cased telescoped ammunition, when compared with conventional cartridge ammunition, is 30% smaller in volume, offers higher performance and is easier to handle. The introduction of CTAGT into gun systems allows for smaller, more reliable handling mechanisms with fewer parts.
- TACOM-ARDEC has over 30 active CRADAs. Some of these are:
 - Quenching Process for Castings - Atchison Casting
 - Sensors for Material Handling - Beckman Engineering
 - Munitions Surveillance - Bulova/SAIC/Mason & Hanger
 - Lightweight Gun Systems - Textron
 - Metallic Coatings - Elmherst Research
 - Howitzer Simulator - Grumman Aerospace
 - X-Ray Technology for Health Applications - Xicon
 - Cubane Derivatives for Medicines - MIT
 - Remote Epileptic Sensor - NY Center for the Disabled
 - Shaped Charges for Oil Exploration - Western Atlas International

EQUIPMENT/FACILITIES

TACOM-ARDEC's Stereolithography Lab provides rapid prototyping for form, fit and function trials and produces masters for soft modeling and investment castings. The lab's capabilities range from the design and fabrication of a sheet "brass catcher" for the Squad Automatic Weapon to the modeling of complete scaled versions of the Crusader and Paladin recoil system prototypes. This service, available to TACOM-ARDEC engineers, academia and industry, reduces the developmental time and associated manufacturing and procurement costs by up to 75%.

The Automated Inspection Device for Explosive Charge in Shell (AIDECS) is replaces visual x-ray film inspection of loaded artillery projectiles. The AIDECS pilot system at TACOM-ARDEC is the only operational unit of its kind, providing the capability to automatically examine 155mm rounds and smaller shells. Base separations, cracks, cavities and other critical defects in the explosive filler are detected by scanning the shell with x-rays. Radiation scattered from within the shell is electrically detected, and a computer analysis identifies and classifies each defect in the explosive. The computer makes an accept/reject decision for each shell and prints an inspection report. Benefits of the AIDECS system include improved reliability for detecting base separations and other critical defects accomplished in a totally automated manner, and cost savings due to elimination of x-ray film.

TACOM-ARDEC's Distributed Interactive Simulation (DIS) facility supports a full spectrum of battlefield simulation activities to determine how technology, weapons and weapon mixes can be used to maximize the effectiveness of the soldier. DIS analyses of weapons in combined arms scenarios can influence designs long before any metal has been "bent", thereby minimizing cost and development time. Linkage to other sites allows real-time interaction on a virtual battlefield.

The Department of Defense's Center for X-Ray Diffraction at TACOM-ARDEC is well recognized for its complete line of sophisticated X-Ray equipment, including two of the latest diffractometers and spectrometers, as well as for the comprehensive knowledge and experience of its personnel. The facility is used to enhance ballistic performance by determining the optimal crystal orientation of warhead and penetrator materials.

Benet Labs represents the Army's capability for large caliber cannon research, design and development, prototype production and engineering support. Benet works closely with the Watervliet Arsenal's cannon production facility to provide rapid prototyping services in support of new and

EQUIPMENT/FACILITIES (continued)

improved weapon systems. Some of Benet's facilities are:

- **FATIGUE EXPERIMENTATION FACILITY:** capability of duplicating firing pressures in its breech mechanism facility and tube facility. This allows the rapid evaluation of new concepts of materials, and the establishment of safe firing lives for these components in the laboratory rather than the much more expensive experimental firing previously necessary. These combined facilities provide Benet with a capability not available anywhere.

- **GAS DYNAMICS LABORATORY:** The Gas Dynamics Laboratory is a new research multi-task facility which includes two firing bays, a high bay area and a laboratory. The high bay area is used for experiments for heavy weapons and weapon components. Instrumentation includes 12 channels of digital data capture and display in 3 synchronized nicolet oscilloscopes with 4K points per channel. There is also a data acquisition system with 10 channels at 256K points per channel.

- **INTEGRATED CAE/CAD/CAM FACILITY:** Benet Labs has a Computer Aided Design system, integrated with Watervliet Arsenal's Computer Aided Manufacturing system. This allows the ready interactive transmission of technical data electronically. Thus, the stress analysts' calculations can be integrated into the engineers' designs for final implementation on the manufacturing floor.

- **FULL SCALE CLIMATIC CONTROL ROOM:** The climatic control is suitable for full scale weapon experiments from -65 Degrees Fahrenheit to + 135 Degrees Fahrenheit.

- **TURRET LABORATORY:** Benet Labs provides engineering support for Turret hardware (less fire control systems) for Tracked Combat Vehicles, including the M551 Light Weight Air Transportable Assault Vehicle, and M60A3 and M1A1 Main Battle Tanks. The Turret Laboratory currently houses all of these vehicles and the tools and equipment necessary for investigation of problems relating to field, depot and spare parts procurement activities.

- **TERRAIN SUSPENSION/TURRET ENVIRONMENT SIMULATOR:** This motion system consists of a large platform (18 ft x 10 ft) mounted on six large hydraulic cylinders, a hydraulic power supply unit and an electronic control cabinet. The simulator is a six-degree-of freedom system (vertical, transverse, longitudinal, put, roll and yaw) and can provide all six motions simultaneously. The maximum payload that can be carried by the simulator is 18,000 lbs. This, it is capable of evaluating a full size tank turret.

- **FULL SCALE INVESTMENT CASTING FOUNDRY:** Benet's investment casting foundry provides the necessary base from which technical support is provided to the Laboratory in the form of the development of new castings and providing prototype castings, to Watervliet Arsenal in the form of production castings to meet initial deliveries until a contractor can start full deliveries, and to Outside Contractors in the form of technical assistance to overcome problems encountered in meeting the requirements of castings for production.

- **MOLTEN SALT DEPOSITION FACILITY:** The refractory metals electrodeposition pilot plant has a its purpose the coating of large caliber gun tube liners and metals having a higher erosion and corrosion resistance than chromium. It has the ability to electrodeposit metals such a tantalum, niobium, molybdenum and tungsten.

- **VESSEL ELECTROPLATING FACILITY:** A full-scale pilot production facility, built and operated by Benet Laboratories in a joint venture with the Watervliet Arsenal, provides a new process technology and the capability for plating an improved form of chromium (LC chrome) on any size cannon tube up to and including the 30-foot long 155-mm "Extended Range: Cannon considered for the Howitzer Improvement Program

- **5KW SURFACE TREATING LASER:** The 5KW, CO2 Laser Metalworking Center integrates a Spectra-Physics 975 industrial Laser system, with a CNC programmable 4-axis work positioner

EQUIPMENT/FACILITIES (continued)

(including rotary tilt table). The Laser system currently provides improved process control via CNC programmability and system flexibility, plus the inherent capability of a Laser to focus large amounts of usable energy in a small area.

- **FULLSCALE COMPOSITES BRAIDING MACHINE:** An alternate method for fabricating composite components is the use of a braiding machine. In this operation, a mandrel is traversed through the center of the braider while 144 strands of material traverse around a carrier ring.

The Armament Technology Facility (ATF) is a 52,000 square foot, secure and environmentally safe integrated small and cannon-caliber design and test facility. The ATF co-locates simulation modeling, design, validation, and diagnostic engineering with the capability to immediately conduct confirmation experimental firings of interior and exterior ballistics. This concurrent engineering facility will support multi-service infantry, air defense, aircraft and combat vehicle armament systems and is available to government as well as private industry. It has four weapon validation bays with an environmental chamber capable of weather conditions between -65F to +165F; two indoor ranges - the first 100 meters in length and the second 300 meters. The latter can accept a Bradley Fighting Vehicle System firing its primary armament; or an Abrams-series tank firing secondary armament. The 300-meter range also has a -65F to +165F environmental chamber for world.

The Keith L. Ware Simulation Center is a research facility specializing in the analysis of helicopter armaments and small arms. The Ware Center is composed of two 100 meter indoor firing ranges and two 1000 inch indoor firing ranges. Small arms can be fired from any number of ground and vehicle mounts as well as several weapon mount simulators located at the center. Helicopter armaments are fired from the 6-Degree-of-Freedom simulator which is capable of mounting a helicopter fuselage and inputting vibration and other motions into it. This allows armaments to be investigated in realistic conditions at a great cost savings over field trials. A large environmental room is available connected to one of the 1000 inch firing ranges. This room can subject items to extreme temperatures from -65 degrees F to +160 degrees F as well as other environmental conditions such as humidity, salt fog, salt immersion, sand and dust. The Ware Simulation Center has extensive instrumentation capabilities to measure characteristic data and performance of weapon systems such as: accuracy, dispersion, rate of fire, round velocity, blast pressure, recoil force, temperature, strain, acceleration, linear and angular displacement, voltage and current. High speed video and regular speed video are also available. Some of the Ware's equipment:

- **VAX 4000-200 Minicomputer Based Fixed Data Acquisition and Analysis System.** This system contains a Kinetic System Data Acquisition unit which can take 32 channels of data at rates up to 250 Khz. System operation is automated through a graphical interface.

- **Hi Techniques Model HT600 Portable Data Acquisition and Analysis System.** This system is capable of taking up to 8 channels of data at rates between 1 and 1,000,000 samples per second. The data can be output immediately in graphical form on hard copy and stored for later analysis. The built-in analysis tools are FFT, digital filtering, integration, differentiation and all common mathematical operations.

- **Metrum Model RSR 512 Rotary Storage Tape Recorder.** This equipment can record up to 16 channels of data at rates up to 1,280,000 samples per second on T-120 VHS format tapes. Recording time on one tape ranges from 50 minutes to 426 hours depending on tape speed.

- **Kodak Ekta Pro High Speed Video.** This equipment can record events at speeds up to 1,000 full frames per second and up to 6,000 pictures per second when the screen is split into six divisions. When the tape is played back at speeds down to manual frame by frame movement, high speed phenomena can be analyzed. The Kodak Motion Analysis Program (MAP) software that automates deflection and motion determination from high speed video tapes is on hand and Ware personnel are experienced in its use.

EQUIPMENT/FACILITIES (continued)

- Mikron Infrared Remote Temperature Measuring System. This system is capable of non-contact measurement of temperatures up to 1600 degrees Fahrenheit.

- Oehler System 82 Personal Computer Based Ballistic Explorer System. This system uses light screens and an acoustic targeting grid to measure and record weapon rate of fire, round velocity, round dispersion and accuracy automatically. System set up and data recording is automated and simplified using PC based commands.

- Spectral Dynamics Modal Analysis System. This system collects data and calculates transfer functions and Fast Fourier Transforms. Software is in place to perform modal analysis.

Electric Armaments Research Center (EARC) has one of the largest capacitor-based pulse power supplies in the world. The EARC was used to conduct large caliber component experiments of electric gun systems, most notably a composite 90mm railgun. This gun tube was one of several different approaches being investigated for a future tank main gun. This tube and others of its class are capable of accelerating special anti-armor rounds to extremely high energies and velocities.

TACOM-ARDEC's Instrumentation and Measurements Lab includes cutting-edge capabilities in the art of data reduction, signal processing, shock resistant telemetry design and radar analysis. One of its facilities consists of a radio frequency anechoic chamber equipped with a radar cross-section (RCS) measurement system utilizing a supercomputer. RCS measurements of various systems, including projectiles, identify radar reflectivity patterns. This technology is used for artillery experiments to evaluate and improve projectile performance parameters such as range, yawing motion, spin and position. Services and capabilities include the following:

- Development of telemetry concepts and systems Telemetry component technology.
- In-bore and in-flight telemetry techniques Secure telemetry systems.
- Qualification, compatibility and RFI Coordination of telemetry operations with test ranges.
- Collection and reduction of telemetered firing test data.
- Printed Circuit Board design, fabrication and assembly.
- Painting and Encapsulation facilities.
- Measurement System Design and Implementation Acoustic and Magnetic Signature Analysis Image Analysis/Processing.
- Industrial Control, Design and Implementation RF Anechoic Studies.
- Robotics.
- Electromagnetic, Electrostatic and RF Survivability Engineering.
- Radar technology for measurement of ballistic flight parameters.
- Radar support for munitions firing programs.
- Support for development of wide band communications links.

The Advanced Warhead Testing Facility provides a safe, armor plate, that will be attached to a 35 foot long tunnel. This allows for extended target standoff experiments for explosively formed penetrators, shaped charges and other experimental warheads.

The TACOM-ARDEC subsonic, transonic and supersonic wind tunnels provide excellent opportunities to apply research to time and cost savings. The facility is used to design, develop and conduct experiments on tactical and training rounds for the Army. The facility has been awarded twelve U.S. patents in the last five years. One of the patents was for a stabilizer for the M831A1 TP-T tank training ammunition, developed using wind tunnel data. Optimization resulting from the experiments saved an estimated \$40 million in annual production costs.

TACOM-ARDEC's Prototype Fabrication and Integration Facility provides for the assembly and check-out of large caliber armament systems. This assembly area, coupled with fabrication, machining and heat treating capabilities, is an integral part of TACOM-ARDEC's technology programs:

EQUIPMENT/FACILITIES (continued)

- Prototype development manufacturing support
- Manufacture, assembly, and test of precision mechanical components.
- Fabrication of precision tools, molds, dies, jigs, fixtures. Heat treating services.
- Welding operations.
- Conventional and numerical controlled machine support. Methods, process, and N.C. engineering support.
- Inspection and calibration support for fabrication operations

Electromagnetic Environmental Effects (E3) facilities perform assessments on weapon systems to determine their compliance against numerous electromagnetic environments such as Personnel Electrostatic Discharge (PESD), Helicopter Electrostatic Discharge (HESD), Hazards of Electromagnetic Radiation to Ordnance (HERO), Electromagnetic Vulnerability (EMV), and Electromagnetic Interference (EMI). High explosives are also assessed at our facilities.

ENVIRONMENTAL EXPERIMENTATION FACILITIES

- Air Guns for linear acceleration experiments: to 200,000 g with soft recovery.
- Rotary acceleration centrifuges: to 1300 g. have slip rings permitting measurement of arming time of fuzes and safing and arming devices.
- Altitude and climatic walk-in and bench chambers for the simulation of any world-wide temperature and humidity conditions.
- Drop facilities Up to 110 ft.
- Jolt, Jumble, Leak, Load, Loose Cargo, Pressure, Rough Handling, Salt, and Fog experiments all with on-line data acquisition and analysis - Mechanical Shock experiments up to 30,000 g. - Water Immersion, Solar Radiation, Spin, Stacking, Thermal Shock, Vacuum-Steam-Pressure, and Vibration: Random, sine, and gunfire, simulating transportation and tactical vibration at extreme temperatures.

Ranges for large caliber ballistic weapons firings for Ammunition/component experiments: - Assembly, disassembly, and modification of ammunition - Foreign ammunition exploitation - Fragmentation studies of ammunition - Hazard classification experiments - Malfunction investigation - Propellant/weapons evaluation - Surveillance of fielded ammunition - 155MM Ballistic Rail Gun-Soft Recovery of Projectiles/Components

ADDITIONAL RANGE CAPABILITIES

- the ARL/FSAC Blossom Point Field Test Facility. The facility has a horizontal range of 6000 ft. (expandable to 12,000 ft.), a width of from 500 - 1000 ft., and a maximum ceiling of 10,000 ft. for high quadrant elevation (Q.E.) test firings. Open field areas make fly-over, parachute and helicopter drops possible. Also, facilities are available for suspension of hardware. An on-site explosive loading room is available for the assembly of fuzes, ammunition, and explosive components. Temperature chambers provide for conditioning rounds or hardware to specified test temperatures. The explosive range limit for any single surface detonation is 15 pounds net explosive weight.

- Instrumentation vans are available to acquire data using telemetry for ballistic firings and direct or remote coupling for static experiments. Photographic data can be acquired by either high resolution video or high speed photographer.

NON DESTRUCTIVE EVALUATION FACILITIES - 25 Million Electron Volt Betatron - 1 Million Electron Volt X-Ray Machine - 200,250,300 Thousand Electron Volt X-Ray Machines - 150 Thousand Electron Volt Faxitron Fluoroscope - Neutron Radiography with Californium Source - Automatic Scanning Densitometer - X-omat Automatic Film Processor - Conventional Ultrasonics - Eddy Current Inspection - Magnetic Particle Inspection - Computer Aided Ultrasonic Inspection - Holographic Interferometry - Impactoscope - Magnetic Flux Leakage Inspection

Armament Research, Development and Engineering Center

Picatinny Arsenal, NJ 07806-5000
(201) 724-6000

Commander: BG James W. Boddie, Jr.
Technical Dir: Mr. Carmine Spinelli

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	2.193	N/A	2.193
6.1 Other	0.490	0.834	1.324
6.2	35.325	39.881	75.206
6.3	12.512	33.314	45.826
Subtotal (S&T)	50.520	74.029	124.549
6.4	40.880	14.470	55.350
6.5	25.611	11.507	37.118
6.6	42.791	40.963	83.754
6.7	2.264	1.760	4.024
Non-DOD	0.549	0.213	0.762
TOTAL RDT&E	162.615	142.942	305.557
Procurement	69.374	204.047	273.421
Operations & Maintenance	44.999	24.626	69.625
Other	11.562	0.114	11.676
TOTAL FUNDING	288.550	371.729	660.279

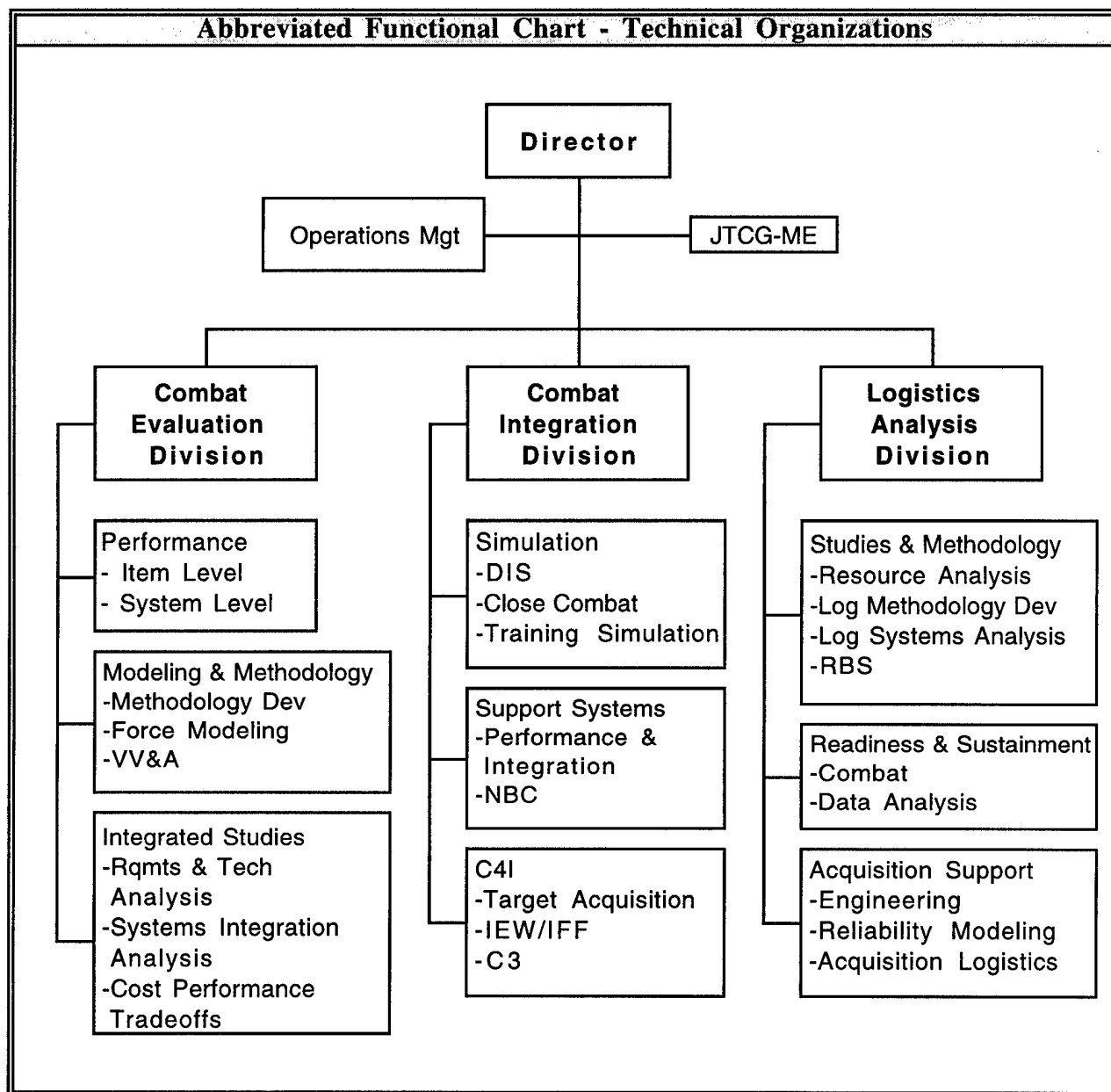
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	11.500

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	37	23	60
CIVILIAN	79	1,806	1,658	3,543
TOTAL	79	1,843	1,681	3,603

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,638.000	REAL PROPERTY	253.300
ADMIN	1,138.000	* NEW CAPITAL EQUIPMENT	0.513
OTHER	1,496.000	EQUIPMENT	253.500
TOTAL	4,272.000	* NEW SCIENTIFIC & ENG. EQUIP.	3.154
ACRES	5,853	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Army Materiel Systems Analysis Activity



Army Materiel Systems Analysis Activity

Aberdeen Proving Gnd, MD 21005-5071
(410) 278-6614

Director: Mr. John J. McCarthy
Military Deputy: COL Charles J. McKenzie III

MISSION

Provide materiel and logistics systems analysis for the Army to support the decision making process.

CURRENT IMPORTANT PROGRAMS

The U.S. Army Materiel Systems Analysis Activity (AMSAA) has two primary mission areas: Materiel Systems Analysis and Logistics Systems Analysis. The materiel systems analyses are funded through AMSAA's RDT&E program; whereas, the logistics systems analyses are funded through AMSAA's OMA program. Materiel systems analysis is accomplished within three core mission functions: item and system level performance, modeling and simulation (M&S), and investment strategies. Wholesale and retail logistics analysis, logistics modeling and methodology development, and force projection and sustainment analysis comprise the core functions of Logistics Systems Analysis.

AMSAA is the Army's center for item and system level performance analysis and certified data. AMSAA utilizes automated data bases and models to characterize the functionality of Army materiel systems. Unique models and methodologies have been developed to accurately predict critical performance variables, such as, weapon accuracy, target acquisition, rate of fire, the probability of inflicting catastrophic damage, and system reliability. This year standard performance data will be provided to major Army and DoD studies, such as, analysis of alternatives (e.g. ATACMS/BAT P3I, Combat ID, MSTAR, ...), TFXI, Joint A2R2, etc. As the Executive Agent for DoD for the tri-service Joint Technical Coordinating Group/Munitions Effectiveness program, AMSAA applies its item level performance expertise to manage the program and to ensure standardized weapons effectiveness assessments are used across the services. The publication of Joint Munitions Effectiveness Manuals provides single source documents for modelers, materiel developers, and strategic and operational planners at all levels.

System performance analysis is initiated in the technology base and evolves with the system through requirements definition, the analysis of alternatives process, insertion into the acquisition cycle, and then extends to fielding and sustainment. AMSAA's linkage with the new Integrated Concept Team (ICT) process creates an opportunity for the Army to take advantage of systems analysis early in the acquisition process. AMSAA is positioned to support ICTs through earlier requirements trade-off analysis before specific solutions are identified. The integration of cost as an independent variable, as part of this process will help ensure the development of cost-effective systems that will provide critical war fighting capabilities to the Army After Next. AMSAA is actively involved in the Army Science and Technology Objective process by examining how emerging technologies can potentially satisfy future Army requirements. As technologies mature and are inserted into the Advanced Technology Demonstration and Advanced Concept Technology Demonstration processes, AMSAA performs verification, validation, and certification of performance data, provides an analytical basis for the formulation of exit criteria, conducts system performance analysis, and verifies, validates and accredits required modeling and simulation. These capabilities support the timely transition of warfighting technologies from the tech base to materiel and system specific applications. AMSAA provides Army project managers and decision makers with comprehensive systems performance and effectiveness capability analysis for systems in the development process. Examples of systems analyses planned in FY97 are: Crusader, AAV, Patriot, Follow-on to TOW, the Extended Range MLRS, the Tank Extended Range Munition (TERM), and the XM 982.

AMSAA's modeling and methodology capabilities support the development, linkage and accreditation of live, virtual, and constructive simulations, and provide unique tools that support

CURRENT IMPORTANT PROGRAMS (continued)

systems analysis of both individual systems and combined arms environments. Internally, AMSAA has resident and maintains over 100 models and simulations, most of which were developed in-house to address specific analytical voids. These models range from component level, physics-based models to force-on-force simulations. As the Army's Executive Agent for verification, validation and accreditation of item level performance models, AMSAA assists model developers with the development and execution of verification and validation plans to ensure new models and simulations faithfully represent actual systems. Additionally, AMSAA is extensively involved in modeling and simulation accreditation across the Army. AMSAA has gained extensive experience in the planning, execution and analysis of Distributed Interactive Simulation exercises and in the verification and validation of Computer Generated Forces and System Simulators. AMSAA was the program manager for the recently completed Anti-Armor Advanced Technology Demonstration that has developed a credible DIS capability to support a broad spectrum of acquisition applications. In the Computer Generated Forces area, AMSAA led the Assessment Study that provided the basis for the Army's investment strategy and the decision to integrate the Modular Semi-Automated Forces and Close Combat Tactical Trainer.

Shrinking modernization budgets have forced the Army to increasingly focus its research and development efforts toward fewer critical systems and capabilities that will equip the force with the most "bang for the buck". AMSAA has developed and implemented new methodologies capable of examining decision alternatives in terms of value added, cost benefit, and total risk. The Anti-Armor Resource Requirements Study, recently completed for the DA Deputy Chief of Staff for Operations and Plans (DCSOPS), is an example of how systems level performance analyses can be performed across weapons and commodity areas to weigh the value of various weapons mix strategies. This analysis compared the relative performance capabilities of future anti-armor systems in the 2005 and 2010 time frames. The ranking of these systems by their contributions on the future battlefield was used to support DA DCSOPS programming decisions. AMSAA is currently working to expand those study findings to the joint armor-anti-armor arena. Potential exists to conduct similar analyses within other battlefield capabilities, such as, sensors and command and control, as well as to examine relative contributions across capabilities.

AMSAA's logistics analysis expertise covers the full range of Army logistics needs, from the development and refinement of new logistics models to the evaluation and analysis of innovative or modified logistics concepts. AMSAA's studies have led to recommendations for major changes to the Army logistics system that will result in significant improvements in the supply, maintenance, and transportation processes.

AMSAA has developed a methodology, known as Readiness Based Sparing, that optimizes Class IX replenishment stocks while maintaining system readiness at a minimized cost at the division level. The methodology has been successfully demonstrated at several sites since 1990 and the National Guard currently has a unit that has used it for over two years. AMSAA is developing a Predictive Logistics Supply concept to improve the supply process. The goals of the program are to provide increased flexibility and responsiveness to the customer, reduce the generation of excess, and to provide the best mix of supplies in a timely manner. The project will result in the development of a comprehensive Program Management Plan detailing a total system architecture. AMSAA logistics analyses support the Army acquisition process with level of repair analyses and initial provisioning analyses for materiel development programs. AMSAA works with the project manager to ensure initial provisioning stocks and maintenance concepts provide adequate logistics support and best value to the Army once systems are fielded.

AMSAA is heavily engaged in analysis to support the Army planning process for sustaining our forces during operations other than war, contingency operations, and in war. AMSAA has been tasked by the Army to study the entire War Reserves Automated Process. The ongoing study aims to identify shortfalls in the current war reserves computation methodology and streamline the process. The results are expected to provide a considerable cost avoidance while improving the readiness of

CURRENT IMPORTANT PROGRAMS (continued)

the Army's warfighting systems. AMSAA developed a methodology that it uses to determine contingency support packages for planned and potential operational deployments. Packages are developed for Class IX spare parts requirements at the Area Support Group, Core Support Group, and Direct Support Group and/or Organizational levels in support of wartime contingency planning. These support packages have been instrumental in planning logistics support and have served to assist in Bosnia, Somalia, Rwanda and numerous other recent Army operations.

AMSAA is the Army agent for Sample Data Collection (SDC). As part of the SDC program, the Field Exercise Data Collection (FEDC) program provides quantitative and qualitative operational maintenance, manpower, reliability and logistical support data for fielded materiel systems. The FEDC program supports combat sustainment and war reserve requirements in support of contingency forces worldwide (e.g. Operation Desert Storm, Operation Vigilant Warrior, Haiti, etc.). Field data also serves to validate critical data elements required in scientific, engineering, and logistical support studies.

AMSAA provides the Army with the critical information and analysis needed to facilitate the complex decisions required to move the Army into the next century. As resources become increasingly constrained, it is critical the Army leadership continue to have access to timely, reliable and high quality analysis on which they can base the decisions required to shape the future Army. AMSAA has developed an integrated a set of skills and tools focused on its core competencies to be responsive to the breadth and depth of systems analysis requirements for the Army now and into the next century.

EQUIPMENT/FACILITIES

Tactical simulation facility for processing classified material. Simulation facility used for development and verification, validation, and accreditation of models and simulations. Additional equipment for use in support of our primary mission areas of materiel and logistics systems analysis.

Army Materiel Systems Analysis Activity
Aberdeen Proving Gnd, MD 21005-5071
(410) 278-6614

Director: Mr. John J. McCarthy
Military Deputy: COL Charles J. McKenzie III

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	20.893	1.162	22.055
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	20.893	1.162	22.055
Procurement	0.000	0.000	0.000
Operations & Maintenance	5.951	0.750	6.701
Other	4.204	8.836	13.040
TOTAL FUNDING	31.048	10.748	41.796

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

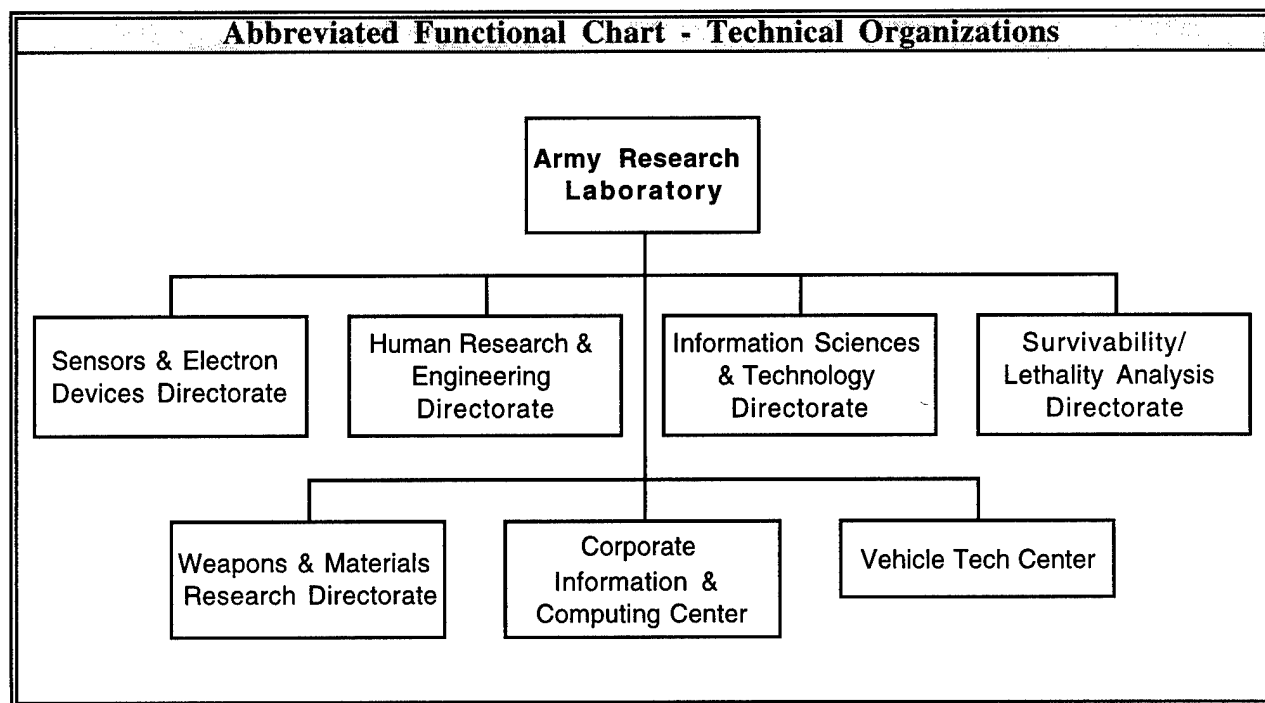
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	8	8	16
CIVILIAN	12	278	80	370
TOTAL	12	286	88	386

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	0.000	REAL PROPERTY	3.596
ADMIN	115.281	* NEW CAPITAL EQUIPMENT	0.000
OTHER	17.064	EQUIPMENT	7.790
TOTAL	132.345	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	4	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Army Research Laboratory



Army Research Laboratory
 Adelphi, MD 20783-1197
 (301) 394-1067

Director: Dr. John W. Lyons
 Dep. Director: Mr. Vito Demonte

MISSION

The mission of ARL is to execute fundamental and applied research to provide the Army with the key technologies and analytical support necessary to assure supremacy in future land warfare.

ARL's vision:

- A laboratory preeminent in key research areas of science, engineering and analysis relevant to land warfare.
- A staff widely recognized as outstanding.
- A laboratory seen by Army users as essential to their missions.
- An intellectual crossroads for the technical community.

CURRENT IMPORTANT PROGRAMS

ARL's Reorganization into five Directorates and two Centers:

- o Human Research and Engineering
- o Information Science & Technology Research
- o Sensor & Electron Devices Technology Research
- o Survivability/Lethality Analysis
- o Weapons & Materials Technology Research
- o Air & Ground Vehicles Technology Research
- o Army High Performance Computing Research

Tech Transfer

- o New CRADAs = 38, New PLAs = 6, New EPAs = 6
- o SBIR awards of \$17.2M (Consisting of 41 Phase I and 19 Phase II awards) Developed new patent marketing strategy
- o Held three patent conferences (one at ALC and two at APG)
- o Refined Tech Transfer Office home page on WEB
- o Data base automatically populates WEB pages
- o ARL technology transfer opportunities with POCs
- o List of CRDAs and PLAs with POCs
- o Full text of ARL patents since 1980 with POCs
- o New success stories with POCs
- ARL's Tech Transfer WEB pages consist of information on:
 - o Tech Transfer Opportunities (over 75 programs)
 - o Facility Data Base (over 55 unique ARL facilities)
 - o Agreement Data Base (212 CRDAs & PLAs)
 - o Searchable Patent Data Base (full text of over 1200 ARL patents since 1980)
 - o Tech Transfer Success Stories (over 12 described)
- ARL exchanges of personnel:
 - o Guest researchers out= 110 (all were technical exchanges, but all were not necessarily 'S&E's')
 - o Guest researchers in = 245
 - o Criteria to qualify for 'an exchange' is 2 or more weeks in or out.

EQUIPMENT/FACILITIES**Flame Research Facility**

This facility enables us to conduct sophisticated studies in flame chemistry in support of propellant combustion simulation, so that advances can be made in gun propulsion. A wide variety of state-of-the-art spectroscopic and mass spectrometric diagnostic tools are used for experimental flame measurements. These measurements can be coupled with sophisticated flame computer models to support not only gun propulsion research but other flame research of military interest, such as fire suppression/extinction, hazardous waste incineration, and soot abatement.

Aerodynamics Range

This range is used to measure the actual flight motion of projectiles up to 37-mm caliber under realistic pressures, densities, and velocities. It is the only range in the U.S. capable of obtaining the accurate data on small and medium-caliber projectiles needed for the preparation of precise aiming data and firing tables.

Transonic Range

This facility measures the actual flight motion of large-caliber projectiles (up to 8-in. diameter) under realistic pressures, densities, and velocities. It is the only range in the free world capable of obtaining accurate data on large caliber projectiles needed for input to artillery fire-control computers and firing tables.

Tungsten Alloy Range

This range routinely conducts full-scale terminal-ballistic experiments with both kinetic-energy penetrators and shaped-charge warheads. It is able to fully instrument the terminal-ballistic tests of all advanced armors, including reactive armor.

Large-Caliber Experimental Test Facility

This self-contained diagnostic test range conducts full interior ballistic testing and evaluation, from the ignition and combustion of propelling charges, through projectile in-bore travel, to muzzle exit. The facility tests and evaluates advanced conventional gun propulsion technologies, electrical propulsion concepts, and innovative propulsion schemes, such as in-bore ram acceleration.

Cannon-Caliber Electromagnetic Launcher Range

This installation measures the launch and flight performance of electromagnetic cannons up to 30-mm caliber. Equipped with a nearly 2.0-MJ power supply and a range of 250 m, it performs diagnostics on electrical, mechanical, and aerodynamic qualities of electromagnetic gun systems.

Explosive Mechanics Facility

At this facility, two enclosed blast chambers can test up to 23-kg of explosive material. The chambers feature high-speed photography (2 million frames per second), flash x-ray devices, four-channel x-ray cineradiography, and high-speed recording equipment. Projectiles are fired into the chambers from an adjacent gun room. The chambers are currently being used to study thresholds in special explosives for reactive armor and fundamental initiation processes in solid explosives. Blast Range Here, three air-driven shock tubes, 0.6, 1.7, and 2.4-m in diameter, simulate air blast from nuclear and conventional weapons. The largest air-driven shock tubes in the U.S., they allow flat-topped and exponentially decaying blast waves to be produced. All three Services use the range for R&D blast loading and response investigations of full-size and scale-model materiel. (Note: A recently constructed Large Blast/Thermal Simulator, to be operated by the U.S. Army Test and Evaluation Command, features a nitrogen-driven shock tube with a 167-m² test section. The facility is currently

EQUIPMENT/FACILITIES (continued)

in its characterization phase.)

Aircraft Vulnerability/Lethality Experimentation Facility (AVLEF)

This test range gives ARL a modern, centralized complex to evaluate the effects of explosive blast and fragmentation warheads, armor-piercing incendiary and high-explosive incendiary projectile impacts, and experimental penetrators and weapons, as well as unconventional threats, on aircraft components, subsystems, and complete operating fixed and rotary-wing aircraft. This testing capability benefits our participation in the DoD Joint Live-Fire Army-Air Force Program, as well as future developmental, specification, and live-fire test and evaluation associated with major Army aviation and anti-aircraft systems. In addition to Army test requirements, AVLEF supports Air Force and Navy-sponsored anti-aircraft warhead lethality evaluations and Aircraft Battle Damage Repair techniques. Specialized test resources and facilities at AVLEF include a blast pad for the evaluation of the effects of large blast/fragment warheads (of up to 100-lb of high explosives) on operating helicopters or fixed-wing aircraft, a covered full-scale dynamic turbine engine and helicopter drive train test pad, indoor and outdoor small-to-medium-caliber ballistic ranges for component and subsystem testing, EPA-approved fuel systems test capability, helicopter rotor-blade static loading fixture, remotely operated helicopter ground test tie-down, mobile airflow generator capable of 500 knots of airflow directed at targets, and a centralized test preparation and control/instrumentation building. A dedicated full-scale dynamic structural test building with ballistic capability was also constructed within AVLEF.

Obscurant Munitions Threat Simulation Facility

Employees at this facility design, develop, and produce munitions that emulate all known obscurant threats, so that we can accurately assess the survivability of developmental electro-optical and electromagnetic systems (e.g., Longbow, Hellfire Missile, and Javelin) on the "dirty" battlefield and advise how to make these systems more robust in these environments. We conduct experiments using simulators, fabricated in this facility, that produce threat smoke and obscurants designed to defeat systems operating in the visible, infrared, and millimeter-wave regions. The facility features a unique white-phosphorus filling machine as well as an analytical laboratory, munitions fabrication equipment, and associated processes.

Screening Threat Simulation Facility

Accurate and realistic simulations of all threat smokes and a variety of experimental obscurants are produced here. Our people design and fabricate a variety of state-of-the-art large-area smoke-screen-generating equipment including foreign and experimental smoke generators, explosively disseminated pyrotechnic munitions and simulators, and indirect-fire simulators. The equipment may be mounted on various vehicles to provide for all-terrain capabilities. Field experiments conducted using this equipment support the analysis of survivability of developmental electro-optical systems and the subsequent design and selection of systems that will function in realistic battlefield environments.

Out-of-Laboratory Facility (OLF)

The OLF supports survivability analyses of developmental weapon systems and assists materiel developers in hardening systems to withstand the effects of electromagnetic pulse (EMP) and other electromagnetic environments. The facility obtains electromagnetic coupling and response measurements through two experimental techniques, radiated continuous-wave and current injection. The Continuous-Wave Instrumentation System (CWIS) radiates sinusoidal electromagnetic fields at selected frequencies between 10-kHz and 1-GHz using two antenna systems, a 1000-ft horizontal dipole and a log-periodic antenna with a large clear 2500-m² test volume. The OLF also features current injection devices capable of producing a broad range of double-exponential and dampened sinusoidal waveforms, including sources that meet MIL-STD-188-125 requirements. Data measured

EQUIPMENT/FACILITIES (continued)

by both techniques are transmitted, via fiber-optic link and network analyzers, to the facility's instrumentation trailer. These, computational resources determine the time-domain response to transient electromagnetic radiation, including the EMP threat, and duplicate threat-level system response to EMP or other transient electromagnetic coupling.

Computerized Mobility/Portability Course

This calibrated obstacle course has become an Army standard for measuring the effects of soldier load on mobility and physiological functions. It consists of hard surfaces and wooded areas, along with obstacles that require the encumbered soldier to run, jump, crawl, climb, and maneuver on foot. The facility is computerized, with the capability for real-time data collection and management. A special feature is the biophysical telemetry system, which monitors the soldier's heart rate, skin and core temperatures, sweat rate, and 'G' loading.

Computerized 600-m Small Arms Range

The Small Arms Range is a state-of-the-art facility for examining soldier weapon performance. It consists of multiple stationary and moving targets, controlled from a computer-equipped command and control center. The range permits the engagement of targets at a wide variety of distances, target exposure times, and angles. It features four firing lanes with target exposures from 10 to 550-m; these firing lanes can be operated simultaneously with different target scenarios. Each lane has five targets at 10 and 25-m for firing personal defense weapons and three targets each at 50, 75, 100, 150, 200, 250, 300, 400, 500, and 550-m for rifle firing. In addition to the fixed targets, each lane has three moving targets at 80, 130, and 180-m, which travel a distance of 15-ft at 90° to the shooter. Special in-house-designed targets and pneumatically operated target mechanisms are also featured. The computerized command and control center can present programmed arrays of targets at any distance, time interval, and sequence. The computer system has a software package that records and reduces range events, such as targets presented, target time, target hits, shots fired, and time of shot. The computer system also features an acoustic measurement system that provides horizontal and vertical coordinates of a hit or a near miss on a target.

Indoor/Outdoor Robotics and Automation Research and Test Facility

Application of robotics technology and automated systems to military operations can enhance weapon system effectiveness, create new capabilities, and reduce risks to soldiers. This facility allows the development of robotics and related technologies. It includes an outdoor 14-acre test area that features a 25-mph sustained-speed test track, a standardized obstacle course, and an explosive-ordnance-disposal robot court, along with perimeter safety barricades and a Global Positioning System (GPS) position-location system. The indoor section contains a 35,000-ft² test area with an RF position-location system, central data-acquisition equipment, and a computing facility.

High-Performance Computing Resources

As part of the DoD High-Performance Computing Modernization Program (HPCMP), ARL has become a DoD Major Shared Resource Center (MSRC). State-of-the-art scalable parallel architectures, workstation clusters, and large vector configurations, supporting both classified and unclassified missions throughout the DoD science and technology community, will be operated at the ARL Aberdeen MSRC facility. ARL provides DoD leadership in the development, acquisition, and implementation of the latest networking technologies through the HPCMP Defense Research and Engineering Network (DREN) initiative. In addition to the MSRC, the Army High-Performance Computing Research Center (AHPCRC), located at the University of Minnesota, provides resources and assistance toward these efforts.

EQUIPMENT/FACILITIES (continued)**Composites Processing Research Facilities**

Advanced low-cost, reliable processing techniques are essential to the future application of structural polymer matrix composites to Army ground vehicles, aircraft, and other materiel. ARL's state-of-the-art composites processing research facilities, such as the fully automated high-temperature (800 ° F) and pressure (450-psi) autoclaves, provide the necessary research tools to address scientific and engineering problems in process optimization and automated process control.

Materials Characterization Facility

This unique facility enables ARL's scientists and engineers to conduct highly detailed measurements of the properties of ceramics, polymers, glasses, and composites. It includes extensive state-of-the-art instrumentation for analyzing the chemical properties of materials at a wide range of temperatures, as well as a full complement of optical and electron microscopy and other electron probe instruments for microstructural analysis, x-ray residual stress analysis, and electrical, magnetic, and thermal property characterization. It also features a unique combination of surface analysis equipment.

Ion Implantation Facility

At this facility, employees develop and demonstrate novel ion surface treatments and coating techniques for Army materiel, such as machine tools and parts subject to corrosive or high-wear environments. This technology is demonstrating significant improvements in the quality of protective coating techniques, such as cadmium and chromium plating. In addition, the ion-implantation process has proven to be environmentally acceptable as an alternative to cadmium, chromium, and other heavy-metal plating processes which, collectively, account for 90 percent of the hazardous wastes generated by all electroplating processes within DoD. A cooperative effort with the Corpus Christi Army Depot is demonstrating the effectiveness and cost benefits of ion-implanted machine tools such as taps, drills, and end-mills.

Special Meteorological Equipment

We have developed a variety of special meteorological equipment to meet unique Army and other customer requirements that cannot be satisfied with standard laboratory instrumentation. Some examples include specialized visible and infrared transmissometers used to evaluate Army electro-optical weapon systems operating in degraded and battlefield-obscured atmospheres, and an atmospheric profiler facility used to measure vertical profiles of wind speed, wind direction, and small-scale turbulence at altitudes up to 2-km in support of ballistic correction requirements. Most of this instrumentation falls within a 40-by-140-mile division-sized area of operations at White Sands Missile Range. We have a variety of automated and manned data-collection points throughout this area, including 20 automated surface observation stations, a meteorological rocket launch complex, and two 500-ft instrumented meteorological towers.

Atmospheric Profiler Research Facility (APRF)

The APRF is a specialized remote sensing, measurement, and analysis facility that supports ARL's program of determining atmospheric effects on system performance through modeling, simulation, and experimentation. The facility provides measurements of high-resolution profiles of the refractive index structure parameter (Cn2), wind, and temperature, using four radar systems: a frequency-modulated continuous-wave (FM-CW) radar, a large-aperture (150-m diameter) 50-MHz profiler, a 404-MHz NOAA Demonstration Network profiler, and a 924-MHz boundary-layer profiler. The FM-CW radar is unequalled for characterizing high-resolution profiles of turbulence in the planetary boundary layer. This ultrasensitive system (~ 165 dBm) provides height resolution of 2-m and profiles as frequent as 3-s. The large-aperture 50-MHz profiler, one of two high-performance research-grade VHF radar systems in the U.S., is calibrated for Cn2 and provides vertical profiles of measured parameters at 150-m height resolution every three minutes and altitudes up to 18-km.

EQUIPMENT/FACILITIES (continued)

above ground level (AGL). It transmits pulses in three sequential beam positions: one vertical and two tilted 15° from vertical in orthogonal directions (i.e., north and east). The 404-MHz profiler is one of 31 identical radars deployed throughout the central U.S. to assess the effectiveness of a network of wind profilers in improving synoptic and mesoscale weather forecasts. The 924-MHz radar is a portable system, featuring a medium-gain, small-aperture antenna, that provides high-resolution wind and temperature measurements at 100-m height resolution and altitudes up to 3-km AGL. The facility also features an acoustic sounder, an array of surface and tower instrumentation, a complete atmospheric radiation station, and balloon-borne instrumentation.

The acoustic sounder, operating at 1850-Hz, provides Cn2 and wind measurements at 25-m intervals from 50-m to 700-m AGL. Three operational towers—a 152-m tower, a 20-m tower, and a 4-m micrometeorological station—provide measurements of wind, humidity, dewpoint and ambient temperature, and other parameters. Sonic anemometers, Lyman-alpha humidity probes, and infrared hygrometers are also used for high-speed measurements. The radiation station consists of an albedometer, a long-wave/short-wave net radiation probe, a four-wave length pyranometer set, a three-band normal-incidence pyrhelimeter solar tracking set, a shadow band pyranometer, and a Linke Feussner actinometer. A tethered balloon system provides specialized profiles of wind, temperature, relative humidity, and Cn2 from the surface to 2-km AGL. The APRF also includes the portable Atmospheric Turbulence Measurement and Observation System (ATMOS), developed by ARL in conjunction with Lockheed Engineering and Sciences Co., a telescope-based system that produces accurate atmospheric characterization measurements in both dark and daylight. Featuring an intensified CCD camera with an electronic shutter allowing exposures as short as 20-s, the ATMOS uses a differential image motion-analysis technique to provide transverse coherence length measurements while minimizing telescope vibration and focus errors. The ATMOS can be operated in both a slant-path mode using stellar sources and a horizontal-path mode with a laser source.

Laser/Aerosol Diagnostic Laboratory

This laboratory features equipment that uses intense continuous-wave and pulsed laser beams to interrogate single aerosol particles of less than a picogram of mass. Airborne particles of current interest include biochemical agents and atmospheric pollutants. Particles can be measured "on the fly" in a flow-through system or can be captured in optical or electrodynamic levitation traps. When particles are irradiated with one or more intense laser probe beams, a variety of phenomena are observed, including polarized elastic angular scattering, fluorescence, stimulated Raman scattering, superheating, explosive vaporization, and laser-induced plasma. These observations allow our scientists to determine aerosol physiochemical properties such as size, dielectric constant, internal structure, chemical composition, and morphology.

Mobile Acoustic Source (MOAS)

The MOAS is a pneumatic loudspeaker system that allows scientists to verify acoustic models with atmospheric effects. The system is a true exponential horn, 56-ft long, with full fidelity from 10 to 500-Hz; it will generate sound sufficient for testing acoustic propagation of sources up to 15-km away. Other features include the following: (1) it is transportable, mounted on an expandable flatbed trailer, (2) it can develop 20,000 acoustic watts of power, or over 160-dB, and (3) it may be controlled via radio-frequency link and fail-safe software to ensure safe operation. The MOAS can reproduce realistic signals simulating any sound at various ranges and under controlled conditions, and it can broadcast single tones, multiple tones, or tape playbacks. No other system with comparable features exists in the world today.

Mobile Atmospheric Spectrometer (MAS)

The MAS is a large-scale spectroscopic and radiometric system designed to meet the requirements of defense and non-defense programs related to identification and characterization of atmospheric effects and constituents. The key components of this facility are a high-resolution infrared

EQUIPMENT/FACILITIES (continued)

spectrometer and a meter-class high-speed tracking telescope. Another important component is the Real-Time Transmittance Modeler (RTTM), a meteorological tower linked to the facility's computer platform. The MAS research team is currently focusing on spectral characterization of military countermeasure obscurants, chemical agent detection methodologies, missile exhaust plume characterization, evaluation of atmospheric impact on electro-optical devices, and general spectroscopic modeling. A portable variant of the large-scale facility is being fielded for DoD environmental compliance activities and dual-use applications, such as greenhouse gas monitoring, industrial emissions identification, and air quality monitoring. Called the Remote Sensing Rover, this portable system is mounted on an all-terrain vehicle platform that provides great mobility for fence-line and general spectroscopic monitoring. The entire system can remain in battery-powered operation for a day or more. It features a spectral library of approximately 10,000 gases and a computer algorithm that, together, can identify trace pollutants in the parts-per-billion range and determine the concentrations of over 150 gases.

Electromagnetic Analysis Facility (EMAF)

This facility conducts full-scale investigations of the vulnerability of weapon systems to electronic warfare, including radio frequency countermeasures (RFCM), millimeter-wave countermeasures, and high-power microwaves (HPM). Electromagnetic susceptibility experiments use three anechoic chambers: the primary investigation anechoic chamber, a 94-ft long, 32-ft wide, and 25-ft high chamber; and two smaller chambers, one used for RFCM and one for millimeter-wave CM. Featuring externally modulated high-power amplifiers, the EMAF offers the capability to continuously sweep from 100-MHz to 18-GHz and to generate pulsed RF of up to 1-MHz and pulsed waves from 50-ns to continuous-wave. The facility can also generate AM, FM, and noise-modulated RF environments to expose the system under investigation to a comprehensive set of conditions that may be encountered in a battlefield. Resident state-of-the-art computational resources are available to provide equipment automation and real-time data analysis and storage. Also featured is a computer-controlled RF-threat emulator that provides complex high-fidelity single RF-threat radar waveforms for the RFCM investigations.

Electro-Optical Countermeasures Missile Flight Simulation Facility

This hardware-in-the-loop missile flight simulator evaluates the effectiveness of EO air defense missile systems in CM environments. The simulator includes major portions of actual missile-guidance and control hardware with software embedded in the simulation loop. Real-time representations are solved, using both digital and analog computers, for missile dynamics in six degrees of freedom and target motion in three degrees of freedom. A multiprocessor digital computer solves the missile aerodynamics and propulsion and the relative target-missile geometry. The analog computer models subsystems with bandwidths too high to allow real-time digital solution, such as the wing servo or gyro transfer function. A second digital computer functions as the simulation controller and supervises the real-time trajectory and field-of-view displays hosted on two PCs. The primary output from the simulation is miss distance at the point of closest approach to the target, a criterion from which the overall effectiveness of a CM technique may be assessed. Further processing of the miss distance into a digital end-game model can yield probability of hit (i.e., missile lethality) against specific threat aircraft.

Electro-Optical Data Acquisition System (EODATS)

The EODATS provides a unique capability of dynamically tracking and measuring target signatures during EW missile firing experiments. It consists of a 35-ft instrumentation van integrated with an automated tracking pedestal capable of controlling the operation of six electro-optical missile seekers in a captive track arrangement. Data collected from the captive seekers can be recorded for post-mission analysis. Video documentation of seeker responses to the EOCM environments aids quick-look analysis. The EODATS is equipped with infrared through ultraviolet spectrometers, radiometers, and imagers to obtain signatures of targets, countermeasures, and backgrounds.

EQUIPMENT/FACILITIES (continued)

Automatic target tracking is achieved with a highly modified Chaparral AN/DAW-1B missile seeker or digital/analog outputs from the control computer. Manual target tracking is also available via a joy stick that operates the track mount (either remotely or directly by telescope optics). The motion of the track mount during a data run can be recorded to a computer file, which can be played back through the track mount to collect background signature data across the same path. The signature measurements of the background can then be subtracted from the target-plus-background data file to achieve target-only measurements. Acoustic/Seismic Countermeasure Vehicle ARL operates a modified 5-ton stake-bed truck that can evaluate acoustic and seismic countermeasures by functioning as an acoustic/seismic decoy and an acoustic jammer. The vehicle houses an acoustic loudspeaker system, consisting of a 12-kW power generator, subwoofer cabinets, and power amplifiers, that can reproduce any signal within a frequency range of 40 to 200-Hz. The vehicle also tows a 750-lb tank sprocket used to generate seismic energy that produces spectral lines similar to those of ground combat vehicles but at a smaller magnitude. To simulate a moving ground vehicle target, the vehicle radiates a pre-recorded target signature as it travels along the ground. To simulate an acoustic jammer, it radiates broad-band noise designed to protect accompanying target vehicles by masking their acoustic signatures. The vehicle is currently being used to examine the effects of decoying and jamming on the Wide-Area Mine System – a system that relies on the acoustic and seismic energies emanating from a ground combat vehicle to engage it as a target.

Field Mobile Measurement System (FMMS)

The FMMS is a special-purpose measurement system that supports EW vulnerability analyses by independently measuring, recording, and certifying EW environments. It can monitor EW environments from 1 to 18-GHz and from 32 to 36-GHz. It can sequentially track up to 12 targets and measure frequency, amplitude, pulse widths, and modulation parameters of various jamming waveforms. The system also features automatic pre and post-mission calibration to ensure the validity of recorded data. Planned upgrades to the FMMS include an optical tracker and auto emplacement that will allow operation at remote sites.

Air Defense Electronic Warfare Facility

This laboratory provides ARL with a quick-reaction capability for the implementation of EW techniques to ensure that all elements of the EW threat required for the vulnerability assessment process are addressed. Specialized hardware is developed and fabricated at this facility for the field experiments associated with surveillance, tracking, and guidance functions of Army systems. The facility supports a wide variety of special-purpose equipment, including airborne and ground-based RF jammers, EOCM equipment, passive RFCM equipment, and state-of-the-art field measurement systems. Although primarily developed to support EW vulnerability analyses, these resources have wide application and are routinely used by the other services as well as the international community.

Ultra Wideband (UWB) Synthetic-Aperture Radar (SAR) Testbed

This roof-top facility provides the capability to collect precise, repeatable SAR data to perform target detection and recognition studies suitable for implementation in an airborne SAR and to test the performance of various radar components. It features a rail-guided, robotically controlled cart that supports the radar on a 115-m laser-leveled-and-aligned track. The current radar system is a fully polarimetric UWB mechanization with an operating frequency range from 40-MHz to 1-GHz. The testbed also features a position-measurement system that defines and records the position of the radar system to generate high-resolution radar imagery of stationary targets in the clear and those embedded in foliage during seasonal changes. These data are used in developing automatic target recognition (ATR) algorithms. A mobile UWB SAR testbed, featuring a 150-ft measurement system, is being built to support vehicle-mounted ground-penetrating radar developments, including mine detection systems. The UWB radar on a 150-ft boom lift allows for collection of two-dimensional apertures to support three-dimensional image formation for improved target detection and identification.

EQUIPMENT/FACILITIES (continued)**Millimeter-Wave Instrumentation Test Facility**

Here, specialists conduct basic research in propagation phenomena, remote sensing, and target signatures over the frequency range from 8 to 300-GHz. The facility is unparalleled in the breadth and depth of its instrumentation and analysis capability. Components and test equipment are available that can be readily configured for conducting feasibility studies of sensor concepts. Supporting tools include high-speed data acquisition and analysis systems, visualization tools, and model generation for performance evaluation. Through a synergistic relationship with the U.S. Army Combat Systems Test Activity (CSTA), ARL can conduct range testing using this facility with a minimum of in-house resources.

Acousto-Fluidic Test Facility

At this location, a full acoustic anechoic chamber allows the study of fluidic sensors, fluidic signal processors, and other microphone systems. Fluidic microphones, with a flat bandwidth down to a true zero hertz (DC), can be configured to be more sensitive than any commercially available microphone. In addition to the research being conducted on these fluidic microphones, they can also be used as a research tool for other programs requiring increased sensitivity and nonelectronic acoustic sensing. The chamber is anechoic pro.

Army Research Laboratory
Adelphi, MD 20783-1197
(301) 394-1067

Director: Dr. John W. Lyons
Dep. Director: Mr. Vito Demonte

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	25.074	37.217	62.291
6.2	79.040	31.526	110.566
6.3	0.000	0.000	0.000
Subtotal (S&T)	104.114	68.743	172.857
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	58.771	49.160	107.931
6.7	1.115	2.526	3.641
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	164.000	120.429	284.429
Procurement	0.008	0.117	0.125
Operations & Maintenance	1.503	0.164	1.667
Other	12.725	144.882	157.607
TOTAL FUNDING	178.236	265.592	443.828

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

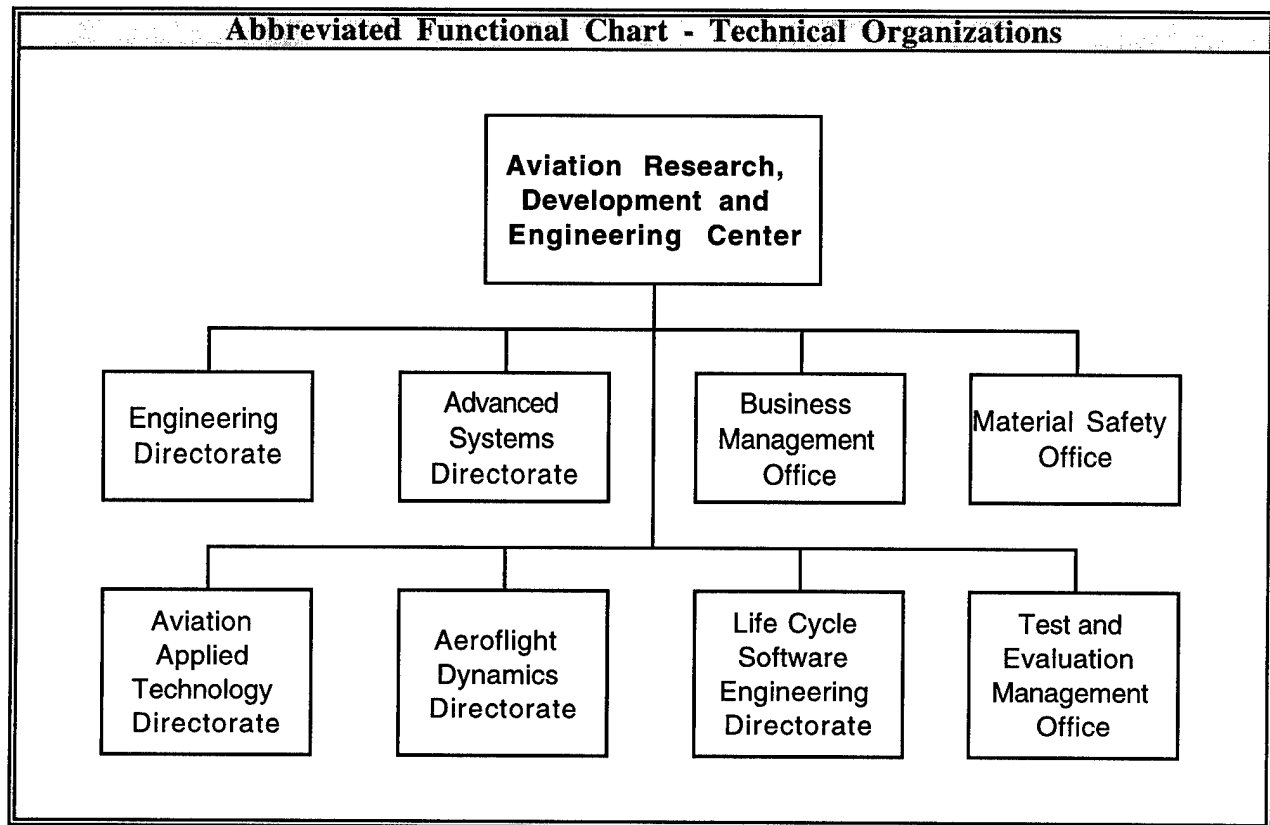
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	8	19	39	66
CIVILIAN	324	1,123	1,099	2,546
TOTAL	332	1,142	1,138	2,612

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,498.000	REAL PROPERTY	601.000
ADMIN	536.000	* NEW CAPITAL EQUIPMENT	48.000
OTHER	125.000	EQUIPMENT	500.000
TOTAL	2,159.00	* NEW SCIENTIFIC & ENG. EQUIP.	27.000
ACRES	1,758	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Aviation Research, Development and Engineering Center



Aviation Research, Development and Engineering Center

St. Louis, MO 63120-1798
(314) 263-1012

Commander: MG Emmett E. Gibson
Technical Dir: Thomas L. House

MISSION

Execute the DoD Rotorcraft Science and Technology program and provide 'one-stop' engineering support to all life cycle phases as required to achieve technologically superior, safe, and supportable Army aviation systems and equipment. The AVRDEC has the responsibility to plan and, in most cases, execute the fundamental basic research, exploratory development, and advanced development programs supporting DoD rotorcraft needs in the areas of aeromechanics, propulsion, structures, reliability and maintainability, survivability, weaponization, avionics mission equipment, and systems integration/simulation.

CURRENT IMPORTANT PROGRAMS

Rotorcraft Pilot's Associate; Joint Turbine Advanced Gas Generator and Integrated High Performance Turbine Engine Technology; Advanced Rotorcraft Transmission; Air-to-Air Starstreak Integrated Advanced Boresight Equipment; Integrated Fire and Flight Control, Advanced Cargo Handling System; Autonomous Scout Rotorcraft Testbed; Unit Maintenance Aerial Recovery Kit; Advanced Composite Structural field repair NDI/NDT; Rotary Wing Structures Technology, Light Weight, High temperature Uncooled Turbine; visual Electro-Optical Signature.

Current CRADAs include:

Flight Dem of a Helicopter Automatic Cannon Air-to-Air Gun Turret - McDonnell Douglas Helicopter
Materials Characteristics of Composite Rotor Blades - Advanced technologies, Inc.
Ballistic testing of Helicopter Composite drive shafts - Boeing Defense and Space Group
Evaluation of Articulated Boresight Equipment - Cubic Precision Radar Detection Analysis - Sikorsky Aircraft
Black Hawk Growth Rotor Evaluation - Sikorsky Aircraft
Associate Cockpit Technology - Sikorsky Aircraft
Appl of Human Factors Research to Short haul Civil Tiltrotor - Boeing Defense and Space Group
Aero and Structural Computer models for AH-64D Helicopter - McDonnell Douglas Helicopter
Collaborative Army Industry Rotorcraft Technology Exchange - Boeing Defense and Space Group
Collaborative Army Industry Rotorcraft Technology Exchange - Sikorsky Aircraft
Impossible Navier-Stokes CFD analysis to Predict Fuselage Drag - Sikorsky Aircraft
AI Technology and Sensors to Army Air and Ground Vehicles - Aerobotics Corporation

EQUIPMENT/FACILITIES

Crew Station Research and development Facility: three blue/red team stations; fiberoptic helmets; one or two seat standard cockpit; Mission Equipment Simulation Evaluation Facility (MESEF) Cockpit; technical center can simulate 11 other aircraft, 99 threats, 20 moving targets, and C3.

Flying Laboratory for Integrated T&E (FLITE): modified AH-1S aircraft; Apache PNVs; reconfigurable voice I/O system; flight symbolot; fully integrated instrumentation.

NASA-Ames Vertical Motion simulator: four interchangeable cabins with virtual TV display; six DOF motioun, acceleration, and velocities; sound generation system; pilot and co-pilot positions.

NASA-Ames Helicopter Human Factors Research Facility: four part-task simulators to investigate; geographic orientation, visual cues simulator, voice actuated controls, and pilot decision-making.

NASA-Langley 14x22 Wind Tunnel: VSTOL/200 knots/variable test section; flow visualization and diagnostics; acoustics capability.

Infra-Red Suppressor Facility: IR suppression fabrication shop; engine and test stand with indoor and outdoor test ranges; Sun workstation and software for: test data recording and analysis, and design and simulation of IR suppressors.

Ballistic Test Range: two outdoor and one indoor test range: fully instrumented for data collection and analysis; full-scale aircraft and component testing; fuel recovery system; API and HEI up to 30mm in caliber. Experimental fabrication facility.

NASA-Ames 40x80x120 Wind Tunnel; NASA-Ames 7x10 Wind Tunnel; NASA-Ames Automation Sciences Research Facility; NASA-Ames Numerical Aerodynamics Simulator; NASA-Ames Fluid Mechanics Laboratory; NASA-Ames Hover Anechoic Chamber. .

Aviation Research, Development and Engineering Center

St. Louis, MO 63120-1798
(314) 263-1012

Commander: MG Emmett E. Gibson
Technical Dir: Thomas L. House

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	1.373	N/A	1.373
6.1 Other	1.829	2.000	3.829
6.2	17.040	16.798	33.838
6.3	4.373	43.598	47.971
Subtotal (S&T)	24.615	62.396	87.011
6.4	1.289	2.206	3.495
6.5	0.000	0.000	0.000
6.6	4.988	10.102	15.090
6.7	0.057	8.603	8.660
Non-DOD	0.000	0.130	0.130
TOTAL RDT&E	30.949	83.437	114.386
Procurement	0.000	1.713	1.713
Operations & Maintenance	16.724	7.386	24.110
Other	8.629	7.737	16.366
TOTAL FUNDING	56.302	100.273	156.575

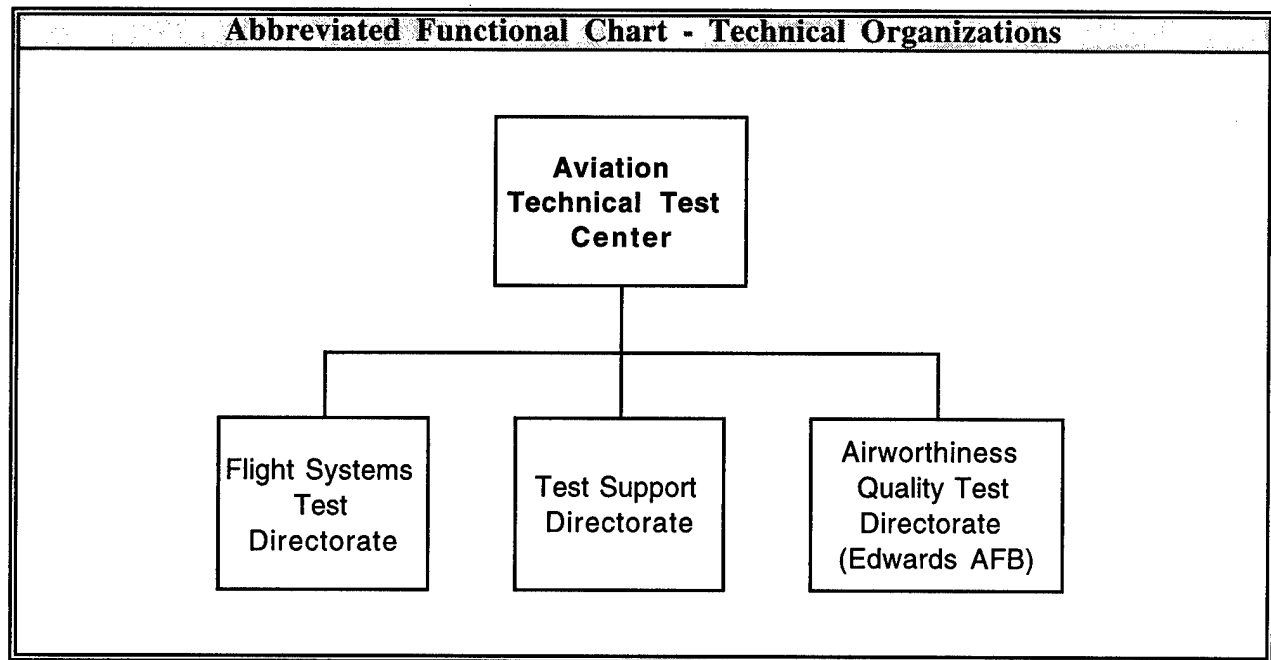
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	5	2	7
CIVILIAN	28	433	281	742
TOTAL	28	438	283	749

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	108.852	REAL PROPERTY	6.652
ADMIN	64.741	* NEW CAPITAL EQUIPMENT	0.050
OTHER	14.730	EQUIPMENT	27.796
TOTAL	188.323	* NEW SCIENTIFIC & ENG. EQUIP.	1.399
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Aviation Technical Test Center



Aviation Technical Test Center

Fort Rucker, AL 36362-5276

(334) 255-8000

Commander: COL Jack O. Shafer, Jr.

Tech Dir: Flucher J. McCrory, Jr.

MISSION

Plan, conduct, analyze, and report the results of developmental tests and studies to include airworthiness flight testing of Army aviation systems and associated materiel/systems. To provide test, test support, development support, and evaluations of aviation materiel/systems; and provide other aviation support for authorized customers as directed by the U.S. Army Test and Evaluation Command.

CURRENT IMPORTANT PROGRAMS

AH-64D Long Bow
RAH-66 Comanche Program
Special Operations Aircraft Program
OH-58D Kiowa Warrior
Avionic Upgrade for National Guard

EQUIPMENT/FACILITIES

Twenty nine rotary and fixed-wing aircraft are currently assigned (2 AH-1F, 5 AH-64A, 3 CH-47D, 1 C-23A, 1 OH-58C, 1 OH-58DI, 6 UH-1H, 5 UH-60A, 1 UH-60L, 1 U-21H, 3 T-34C) as test beds. Helicopter Icing Spray System (HISS): a CH-47D with an integrated 1,800-gallon water tank and spray apparatus combined with a highly instrumented U-21A to provide cloud physics documentation, conducts in-flight icing evaluations under both artificial and natural conditions. Full flight test instrumentation capability exist. Analog and digital aircraft data can be recorded and/or telemetered to the ground. On-site data processing and display exist--real time and postmission. Capability to collect and process video, still, and high-speed pictures exists.

Aviation Technical Test Center
Fort Rucker, AL 36362-5276
(334) 255-8000

Commander: COL Jack O. Shafer, Jr.
Tech Dir: Flucher J. McCrory, Jr.

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	14.780	0.000	14.780
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	14.780	0.000	14.780
Procurement	0.694	0.000	0.694
Operations & Maintenance	0.000	0.000	0.000
Other	1.846	0.000	1.846
TOTAL FUNDING	17.320	0.000	17.320

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

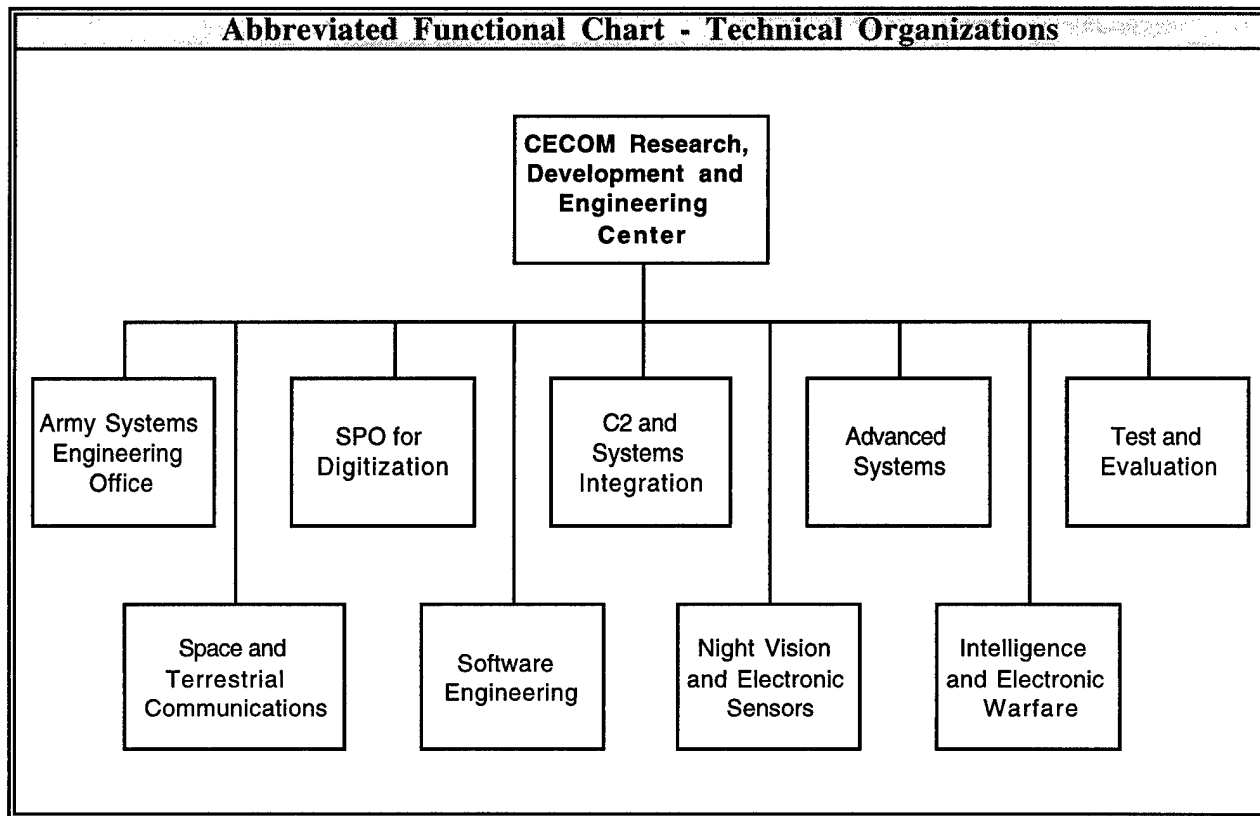
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	29	15	44
CIVILIAN	0	30	55	85
TOTAL	0	59	70	129

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	0.000	REAL PROPERTY	3.600
ADMIN	98.125	* NEW CAPITAL EQUIPMENT	0.000
OTHER	233.000	EQUIPMENT	139.436
TOTAL	331.125	* NEW SCIENTIFIC & ENG. EQUIP.	0.443
ACRES	11,025	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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CECOM Research, Development & Engineering Center



CECOM Research, Development & Engineering Center

Ft. Monmouth, NJ 07703-5209
(908) 427-2686

Director: Mr. Robert F. Giordano
Military Deputy: COL Robert G. Shively

MISSION

The Communications-Electronics Command Research, Development and Engineering Center (CECOM RDEC), headquartered at Ft. Monmouth, NJ, is the AMC Center for research, development and engineering in Command and Control, Communications, Computers and Intelligence (C4I); Information Warfare/ Information Operations; Electronic Warfare; Night Vision and Electro-Optics; Countermine; Power Sources and Avionics. The CECOM RDEC's mission is focused on providing support to the PEO's, PM's and other customers; managing technology base programs by defining, developing and acquiring superior technologies; developing, acquiring, testing and evaluating systems; and sustaining and enhancing systems and equipment for a trained and ready Army undergoing revolutionary changes.

CURRENT IMPORTANT PROGRAMS

CERDEC provides critical support to Task Force XXI by providing the technologies designed to increase the speed and precision of information flow on the battlefield, enhancing the planning, rehearsing and execution of combat operations. The CERDEC's Digital Integrated Lab/Testbed (DIL/T) is instrumental to TF XXI in its ability to verify interfaces, identify interoperability problems and characterize systems performance to ensure overall compliance with digital architecture. Our work in Mission Planning & Data Base Distribution will allow the TF XXI commander planning functions for mission and task structures, limited wargaming, mission rehearsal, execution monitoring, and 3D terrain rotation and 'fly-through' on a desk top platform.

Battlespace Command and Control (BC2) Advanced Tech Demo will demonstrate, through simulation and experimentation with the user, a C2 and Battlefield Visualization Commander/Staff Workstation to support Consistent Battlespace Understanding; Forecasting, Planning & Resource Allocation; and Integrated Force Management for the Commander and Staff. BC2 ATD will develop and model the architectural basis for information transfer to/from lower/higher echelons including interfaces to Joint and Coalition forces to support worldwide, split-based military operations.

Digital Battlefield Communications ATD will exploit emerging commercial comm technologies to support multimedia comm in a highly mobile dynamic battlefield environment to support the Digitized Battlefield's increasing demand for comm bandwidth and global coverage.

Digital Comm Electronic Attack STO will provide the capability to intercept and bring under electronic attack advanced communications signals being used by adversarial command and control networks on the digital battlefield.

Hunter Sensor Suite ATD will demonstrate the feasibility of a lightweight, deployable and survivable hunter vehicle platform with an advanced, low observable, long range hunter sensor suite. It will combine second generation thermal imaging, day TV, eye safe laser rangefinder, embedded target recognition, and image compression/ transfer technology.

Mine Hunter Killer ATD will demonstrate an integrated sys concept to autonomous detection and destruction of mines at maneuver speeds.

Total Distribution ATD. CERDEC will continue development of the functionality of the Log Anchor Desk while integrating it with data sources as they are developing and integrating it into the C2 System's architecture.

CURRENT IMPORTANT PROGRAMS (continued)

- Tech Transfer: CERDEC had 43 active Cooperative R&D Agreements (CRADA) in FY96, including one for the development of architectures employing Asynchronous Transfer Modes and one for the enhancement of data fusion technology for a variety of military and non-military applications.
- Small Business Innovation Research (SBIR). SBIR 'seed money' totaling \$11.4M was placed on 81 contracts designed to increase commercialization (Phase III) of SBIR research in military and private sector markets. Two new CERDEC SBIR projects transitioned into Phase III status utilizing external funding. Two Phase III projects were published in the Army 1996 SBIR Success Pamphlet.
- Under DARPA's Technology Reinvestment Program CERDEC has formed a strategic alliance with premier New Jersey companies to win selection of a \$2.5M multiyear program to develop a Wireless Interworking Testbed.
- Independent R&D (IR&D) Program. CERDEC has a most lucrative Tech Interchange Meeting (TIM) program, with 8 meetings in FY96 representing 54 projects valued at \$28.2M.

EQUIPMENT/FACILITIES

The RDEC boasts many U.S. Government-unique and world-unique facilities supporting a broad range of technical areas. These facilities will significantly enhance RDEC's ability to increase productivity for future R&D efforts in a timely and cost effective manner. The following is a representative sampling of the RDEC state-of-the-art equipment and facilities.

The Digital Integrated Lab/Testbed (DIL/T) is a dynamic world-class integrated facility that electronically links distributed RDEC labs, industry facilities, Battle Labs, field sites, and joint activities. The DIL/T can be rapidly reconfigured to replicate diverse existing and evolving tactical C3I/IEW battlefield environments for systems engineering, development, integration and evaluation of the digital battlefield. The Army Digitization Office has mandated that all equipment and technology to be used in the Digital Battlefield must be tested and/or run through the DIL/T.

The Software Prototyping and Integration Lab (SPIL) has the staff and tools to perform the full range of software engineering efforts, including prototype engineering development, integration with existing products, code conversions, product evaluations, product enhancements, and software reuse.

The Commercial Communications Technology Lab (C2TL) was established to take advantage of commercial breakthroughs by assessing their utility for military applications with the main objective being to ensure timely, successful and cost effective insertion of commercial technology. The C2TL is a key component of the DIL/T. Industry is encouraged to use these facilities to demonstrate their evolving technologies, Independent Research and Development (IR&D) efforts, and communications products for military utility and applications.

RDEC is in the process of constructing a new facility totaling 105,685 SF of R&D area and a 16,000 SF limited access warehouse for the Intelligence and Electronic Warfare Directorate. The R&D facility is being built to limited access and sensitive compartmented information facility (SCIF) and will house the Automated Data Processing Lab/Common Ground Station, Anechoic Chamber and the System Integration Lab.

Our Signals Analysis Lab is the only U.S. in-house source of the critical signal processing required for technology development of highly classified signals and for rapid analyses and responses to changing threats emerging from areas of high national interest. Central facility which combines hardware and software capabilities for digital signals analysis and waveform measurement. Some of the equipment has unparalleled capability in either Government or industry.

CECOM Research, Development & Engineering Center

Ft. Monmouth, NJ 07703-5209

(908) 427-2686

Director: Mr. Robert F. Giordano

Military Deputy: COL Robert G. Shively

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	1.605	N/A	1.605
6.1 Other	1.328	0.342	1.670
6.2	33.790	34.956	68.746
6.3	30.116	106.375	136.491
Subtotal (S&T)	66.839	141.673	208.512
6.4	18.225	11.797	30.022
6.5	6.188	13.397	19.585
6.6	12.063	18.874	30.937
6.7	4.982	10.028	15.010
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	108.297	195.769	304.066
Procurement	22.469	73.391	95.860
Operations & Maintenance	26.402	123.084	149.486
Other	3.304	63.982	67.286
TOTAL FUNDING	160.472	456.226	616.698

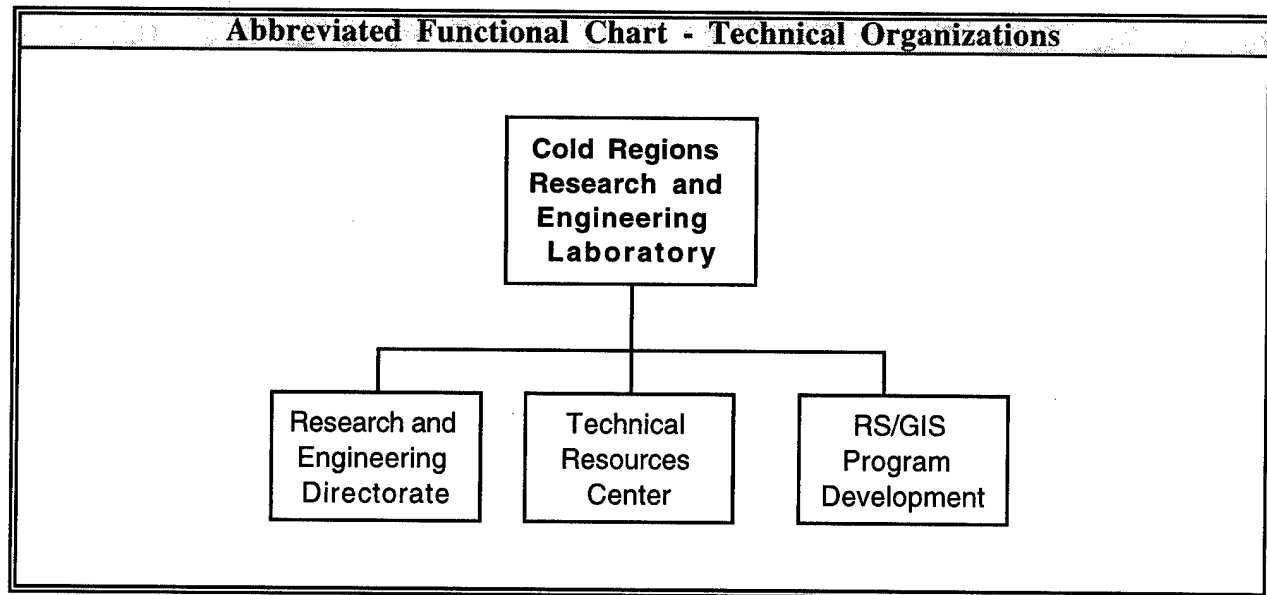
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	11	61	72
CIVILIAN	72	1,335	765	2,172
TOTAL	72	1,346	826	2,244

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	421.400	REAL PROPERTY	65.600
ADMIN	361.900	* NEW CAPITAL EQUIPMENT	0.000
OTHER	16.900	EQUIPMENT	260.236
TOTAL	800.200	* NEW SCIENTIFIC & ENG. EQUIP.	12.023
ACRES	2,299	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Cold Regions Research & Engineering Laboratory



Cold Regions Research & Engineering Laboratory

Hanover, NH 03755-1290
(603) 646-4100

Commander/Director: LTC Mark Nelson
Deputy Commander: MAJ Bruce Gwilliam

MISSION

Advancing knowledge of the cold regions through scientific and engineering research and putting that knowledge to work for the Army, DoD and the Nation is the mission of the U.S. Army Cold Regions Research and Engineering Laboratory (USACRREL). Operating in cold regions requires appropriate equipment, training and doctrine, often very different from those used in more temperate conditions. These special requirements cover a broad range of military activities and can incur significant cost or capability penalties. Special challenges of cold regions exist on the more than 30% of the earth's surface that is covered by ice or underlain with permafrost. In addition, persistent and severe winter conditions occur in 50% of the earth's surface including areas of Europe, Asia and North and South America. Bosnia/Herzegovina and North and South Korea are areas of interest today that experience severe winter conditions that are significantly impacting military operations.

USACRREL provides the technology to allow the Army to operate effectively in cold regions environments to maintain national security and foster peace. USACRREL R&D focuses on all aspects of the cold/winter environment and its implications for military activities in garrison or on the battlefield. The singular exception being individual soldier clothing and equipment. CRREL also addresses the nations winter water resources issues through the civil works program of the Corps of Engineers. Having a single-focused cold regions R&D organization that is the primary source of special expertise for DoD, and both serves and leverages resources and efforts of other federal, state, and local agencies and the private sector, is an investment strategy that has resulted in an outstanding and cost effective capability for DoD and the Nation.

CURRENT IMPORTANT PROGRAMS

USACRREL's current military programs are concentrated in four major R&D areas: Military Engineering, Battlespace Environments, Civil Engineering, and Environmental Quality.

Military Engineering - Providing innovative solutions to the difficult engineering problems that the soldier faces in winter within the confines of existing and emerging equipment and manpower resources is the primary thrust of the CRREL military engineering research efforts. This work is accomplished in conjunction with the primary materiel developer or with troop units to assist in focusing the research and provide direct transition and feedback. Focus areas are winter combat engineering, mobility, and operability. This research serves the cold regions requirements of all the military services and is directly relevant to current Army activities in Korea and Bosnia.

The Battlespace Environments research supports the design, test and evaluation of new systems through characterization, modeling and simulation of the highly varied world environmental conditions and their impact on systems (fielded or notional) performance. Winter and cold regions conditions are particularly difficult constraints for systems development and operation. Examples of direct support include icing problems for aircraft, modeling and simulation of the background environment and its impact on smart weapons systems and mine/countermine systems, and the ability to project the environmental conditions in denied areas or into the future to assist in C4I. Research at CRREL serves the cold regions needs of all military services. Of particular significance is the support to the Navy for Arctic operations and to the Air Force and Army on the impact of winter conditions on ATR and smart weapons systems. Research on the low temperature performance of composites for the Army and Air Force supports the Advanced Materials pervasive function.

CURRENT IMPORTANT PROGRAMS (continued)

The Civil Engineering (CE) R&D generates technology for cost reductions in designing, building, operating, and maintaining military facilities in areas that experience harsh winter and severe cold weather, where infrastructure life-cycle costs and energy costs are high. USACRREL CE R&D efforts help solve critical DoD civil engineering problems related to training, mobilizing, deploying, sustaining, protecting, and employing U.S. Forces in cold environment at any time. Research in this area supports Tri-Service winter and cold regions issues.

The Environmental Quality R&D generally supports the test and evaluation of materiel systems through maintenance of training and test ranges, allowing their continued use while conserving the integrity of the environment. This is an especially difficult problem for ground vehicles and weapons systems that can have dramatic impacts on the flora and fauna of military ranges. The environmental quality area also has close ties to the Battlespace Environments area because of their common need for characterization and quantification of the geophysical processes that govern both the impact of the operating environment on military operations and systems, and the impact of activities on the quality of the natural environment. USACRREL research supports compliance, cleanup, and conservation goals focusing on special constraints imposed by winter conditions and cold climates. Research in this area supports Tri-Service cold unique environmental quality issues.

EQUIPMENT/FACILITIES

USACRREL has a complex of low temperature laboratories and experimental research facilities not found anywhere else in the world. The main laboratory consists of 24 low temperature research laboratories with a temperature range down to -35 degrees F. The 73,000 square foot Ice Engineering Facility houses three special-purpose research areas; a large low-temperature towing tank, a 100-foot long refrigerated flume for modeling rivers, and a large hydraulic-model room for studying ice impacts on civil works facilities, primarily locks and dams. The 29,000 square foot Frost Effects Research Facility (FERF) supports full-scale research on the impact of freeze-thaw cycles on pavements, foundations, and utility systems. The nationally unique FERF facility provides capability to simulate natural 3-D freeze-thaw cycles to study in-situ seasonal evaluation of combat equipment, development of effective doctrine and techniques, and support to DoD initiative on counter proliferation and treaty verification in cold environments. A DoD-unique 9000 square foot Low Temperature Materiel Test Facility provides additional capability focusing on winterization of military hardware systems. USACRREL's Low Temperature Materials Laboratory is a DoD-unique facility specially designed to investigate composite materials performance subject to low-temperature and thermal cycling for potential use for future Army Armor Vehicles. CRREL has access to two permafrost research sites in Alaska.

In addition, USACRREL houses the 16,400 square foot Corps of Engineers' Civil Works Remote Sensing/Geographic Information System Center, and a state-of-the-art DoD Cold Regions Technical Information Analysis Center (CRSTIAC). The 24,000 square foot CRSTIAC facility is home to the most comprehensive collection of cold regions science and engineering data in the world.

Cold Regions Research & Engineering LaboratoryHanover, NH 03755-1290
(603) 646-4100Commander/Director: LTC Mark Nelson
Deputy Commander: MAJ Bruce Gwilliam

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.214	N/A	0.214
6.1 Other	1.700	0.166	1.866
6.2	5.549	0.773	6.322
6.3	0.000	0.000	0.000
Subtotal (S&T)	7.463	0.939	8.402
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	6.401	0.872	7.273
6.7	2.097	1.844	3.941
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	15.961	3.655	19.616
Procurement	0.000	0.000	0.000
Operations & Maintenance	6.549	0.796	7.345
Other	5.738	1.213	6.951
TOTAL FUNDING	28.248	5.664	33.912

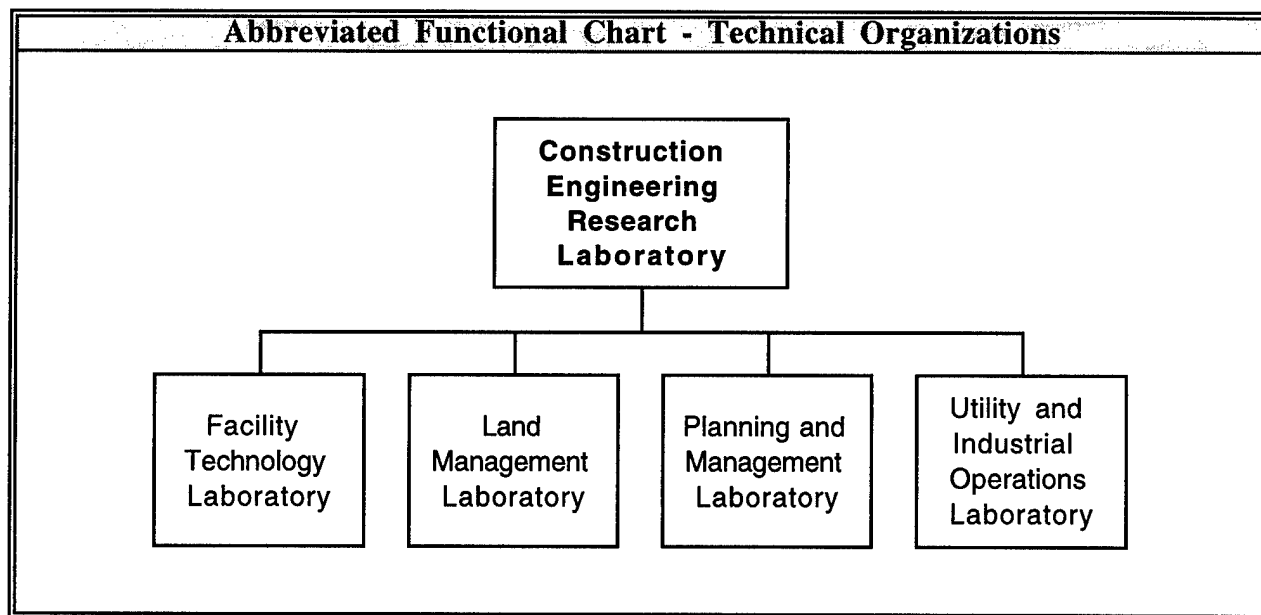
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	1	3	0	4
CIVILIAN	62	57	182	301
TOTAL	63	60	182	305

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	242.200	REAL PROPERTY	34.600
ADMIN	2.400	* NEW CAPITAL EQUIPMENT	0.200
OTHER	66.400	EQUIPMENT	2.200
TOTAL	311.000	* NEW SCIENTIFIC & ENG. EQUIP.	1.000
ACRES	207	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Construction Engineering Research Laboratories



Construction Engineering Research Laboratories

Champaign, IL 61826-9005
(217) 373-6714

Director: Dr. Michael J. O'Connor
Commander: COL James T. Scott

MISSION

OCE General Orders 17, 9 Sep 68, established USACERL as a Separate Field Operating Agency (SFOA) under the Chief of Engineers. By OCE General Orders 16, 20 May 74, USACERL was placed under the staff supervision of the USACE Research and Development Directorate. ER 10-1-26 assigns USACERL the mission of performing infrastructure and environmental sustainment research, development, studies and technical assistance to maintain a quality trained and ready Army; to set the standard in preserving and protecting its land, water and natural and cultural resources; and to repair, maintain and rehabilitate civil works facilities. It performs research and development for enhancing engineer capability to deploy rapidly and to sustain a full range of military operations. It executes the mission through various functional elements.

CURRENT IMPORTANT PROGRAMS

Building Design and Rehabilitation for Seismic Loads
Facility Delivery Redesign
Engineered Management Systems (EMS)
Smart Structural Systems
Integrated Directorate of Public Works (DPW) Management System
Utilities Modernization and Optimization for Military Installations
Process Energy and Pollution Reduction (PEPR)
Training Land Carrying Capacity
Protocols for Military Training to Reduce Impact on Threatened and Endangered Species

EQUIPMENT/FACILITIES

Triaxial Earthquake and Shock Simulator (TESS): The United States' first large triaxial shaking table is a unique dual-mode shock and vibration test facility. The TESS, in its biaxial mode, simulates a wide range of transient shock vibrations typical of military applications requiring large accelerations over a wide frequency range with moderately heavy test specimens. In the triaxial mode, it can simulate a variety of vibration environments including earthquakes and random vibrations, as well as log-sweep and resonant searches. The TESS is one of the premier seismic experimental test facilities in this country, supporting experimental research that cannot be performed by any other U.S. organization.

Ion Plating Systems: Custom-designed to meet highly specialized research specifications to do small scale prototype thin film coating experiments; only facility of this kind (plasma-assisted physical vapor disposition) in the Army.

Heating, Ventilation and Air Conditioning Test Facility: A large 'mini-facility' with four rooms (zones that can be thermally controlled separately to replicate a variety of HVAC systems and conditions, including dual or single duct and variable or constant air volume conditions; includes ventilation system, hot water supply loops, chilled water supply loops, HVAC systems configuration, facility controls, and data acquisition system; used to validate the energy thermodynamics analysis program and to analyze performance of proposed standard digital control panels; unique with in DoD.

Acoustics Lab: The Impulse Noise Technology Center is a state-of-the-art lab facility for the quantification and reduction of impulse noise from cannon, helicopters, blast and small caliber weapons firing. Contains a variety of sophisticated noise monitoring, recording, and analysis instrumentation for research on impact assessment and mitigation of impulse noise related to human annoyance and animal disturbance. Also includes a one-of-a-kind noise impedance tube for the test of noise energy absorption along surfaces.

Paint Laboratory: Specialized equipment necessary to perform Qualified Product List testing on paints used by the Army (an 'honest broker' function); capability to manufacture lab size batches of experimental coatings and perform both real-time and accelerated performance testing of coatings; capability to perform forensic analysis of paint samples.

Equipment and facilities co-located at the University of Illinois, Urbana-Champaign: In 1966, the U.S. Army Corps of Engineers proposed a new laboratory for engineering research to support military construction. In national competition in 1967, the University of Illinois at Urbana-Champaign was selected for co-locating USACERL. This unique relationship between USACERL and the University of Illinois, annually cited as one of the top three engineering schools in the nation, has been touted by HQ USACE as a prime example of 'reinventing Government.' Of approximately 650 personnel working at USACERL, over 200 are University of Illinois faculty, staff or students. Designated as an allied agency of the University of Illinois, \$250-500 million of University of Illinois research laboratory equipment is accessible.

Controlled Archeological Test Site: A two acre site, now under construction, to test the accuracy of remote and geophysical prospecting techniques to identify the location and significance of buried archeological sites and artifacts. Within the site are buried a variety of items to represent artifacts. Both industry and academia have expressed interest in using the site to test and demonstrate techniques for non-invasive identification and assessment of materials. Initial demonstrations in the queue include ground penetrating radar, phased array acoustic signature, and magnetic resistivity. Construction of the site was initiated through funding from the National Park Service.

Construction Engineering Research Laboratories
Champaign, IL 61826-9005
(217) 373-6714

Director: Dr. Michael J. O'Connor
Commander: COL James T. Scott

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.072	N/A	0.072
6.1 Other	3.316	1.422	4.738
6.2	14.132	11.401	25.533
6.3	0.000	0.000	0.000
Subtotal (S&T)	17.52	12.823	30.343
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	5.386	2.952	8.338
6.7	0.000	0.000	0.000
Non-DOD	2.946	1.024	3.970
TOTAL RDT&E	25.852	16.799	42.651
Procurement	0.000	0.000	0.000
Operations & Maintenance	15.177	17.187	32.364
Other	0.000	0.000	0.000
TOTAL FUNDING	41.029	33.986	75.015

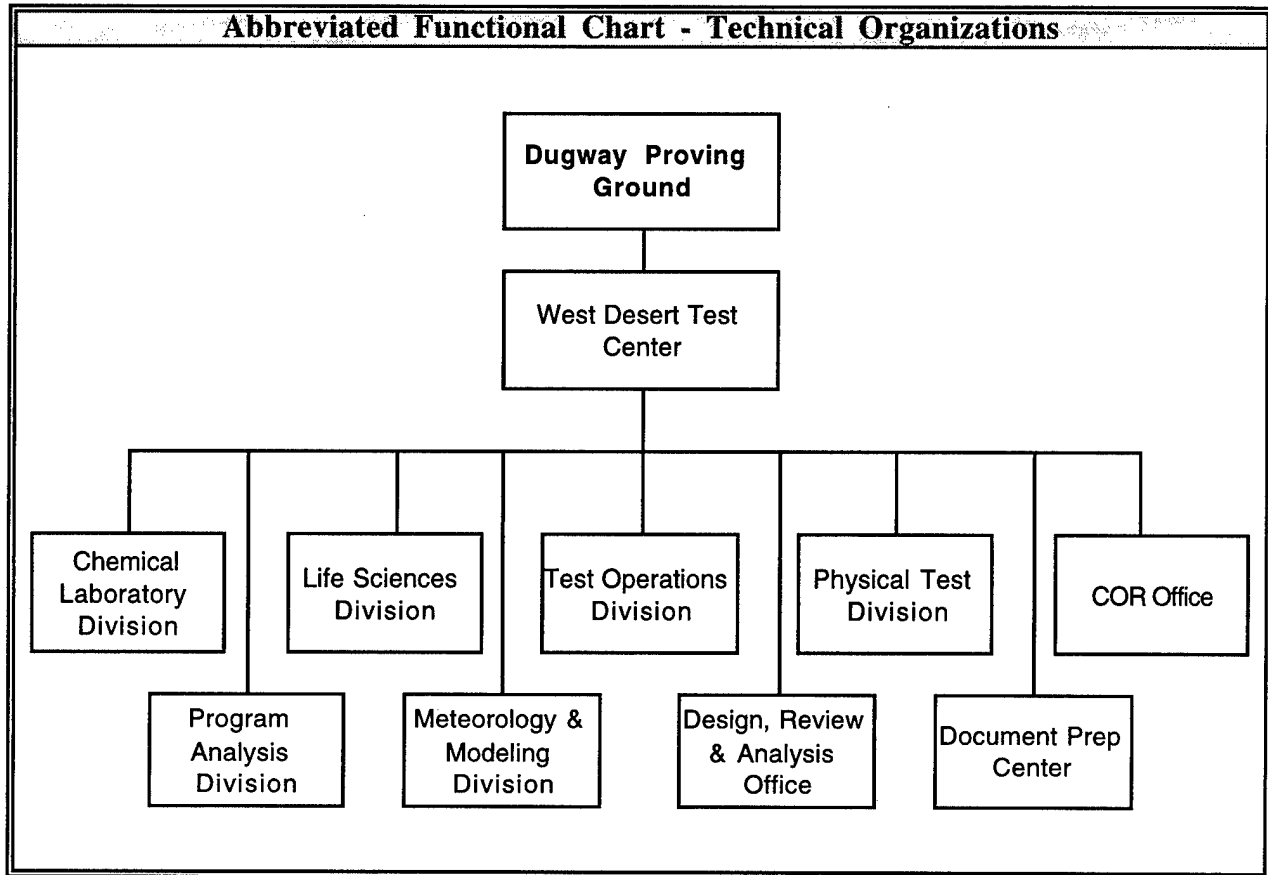
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	2	0	2
CIVILIAN	55	152	137	344
TOTAL	55	154	137	346

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	118.896	REAL PROPERTY	0.000
ADMIN	55.882	* NEW CAPITAL EQUIPMENT	0.000
OTHER	29.081	EQUIPMENT	16.917
TOTAL	203.859	* NEW SCIENTIFIC & ENG. EQUIP.	0.025
ACRES	33	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Dugway Proving Ground



Dugway Proving Ground
Dugway, UT 84022-5000
(801) 831-3701

Commander: COL John A. Como
Technical Director: I. Gary Resnick

MISSION

Plan, conduct, analyze and report the results of exploratory, developmental, and production tests of chemical and biological defense systems, smoke and obscurant materiel and delivery systems, incendiary devices. Operates the proving ground as a DoD Major Range and Test Facility Base (MRTFB) and operate the Environmental Characterization and Remediation Technology Test Center. DPG is the DoD-designated Chemical and Biological Defense Test and Evaluation Reliance test site.

Test illuminating and obscuring artillery, mortars and rockets. Perform tests of all material commodities to assess chemical and biological hardness and contamination/decontamination survivability. Test procedures and by-products of chemical and conventional weapons demilitarization. Perform tests and develops procedures for on-site verification inspections for chemical weapons treaties. Dugway provides the base of operation for the Joint Services Project, Chemical and Biological Joint Contact Point and Test, which provides chemical and biological defense information and operationally oriented tests and analysis to the Services and CINCS.

CURRENT IMPORTANT PROGRAMS

Research, development and laboratory investigations. Joint-operations chemical and biological defense tests and studies for CINCS and Services. Munitions development/acceptance and production testing. Environmental studies to support DPG and Army programs.

EQUIPMENT/FACILITIES

Instrumented grids for chemical, biological and smoke/obscurant systems. Artillery range for conventional and chemical metal parts. Ballistics and dissemination tests with field sample, sample mass analysis, meteorological (auto data acquisition and MESOMET network) system. Physical and environmental test facility (MIL SPEC 810) chambers for total agent containment. Operations supported by meteorological research on behavior of clouds. Chemical, life science technology, ecological survival of DPS. Capability for planning analysis, evaluation of tests and operations research. Labs equipped for wide range of chemical, microbiological, toxicological, immunological and pollution studies. Technical and mass array of fluorescent air tracers. External-communication and range safety system. Outstanding features are: large land area, restricted air space, long and flat artillery ranges, projectile recovery, sonic and electromagnetic sterility and diverse technical and scientific skills.

Dugway Proving Ground
Dugway, UT 84022-5000
(801) 831-3701

Commander: COL John A. Como
Technical Director: I. Gary Resnick

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	27.000	19.000	46.000
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	27.000	19.000	46.000
Procurement	0.000	0.000	0.000
Operations & Maintenance	1.000	1.000	2.000
Other	2.000	1.000	3.000
TOTAL FUNDING	30.000	21.000	51.000

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

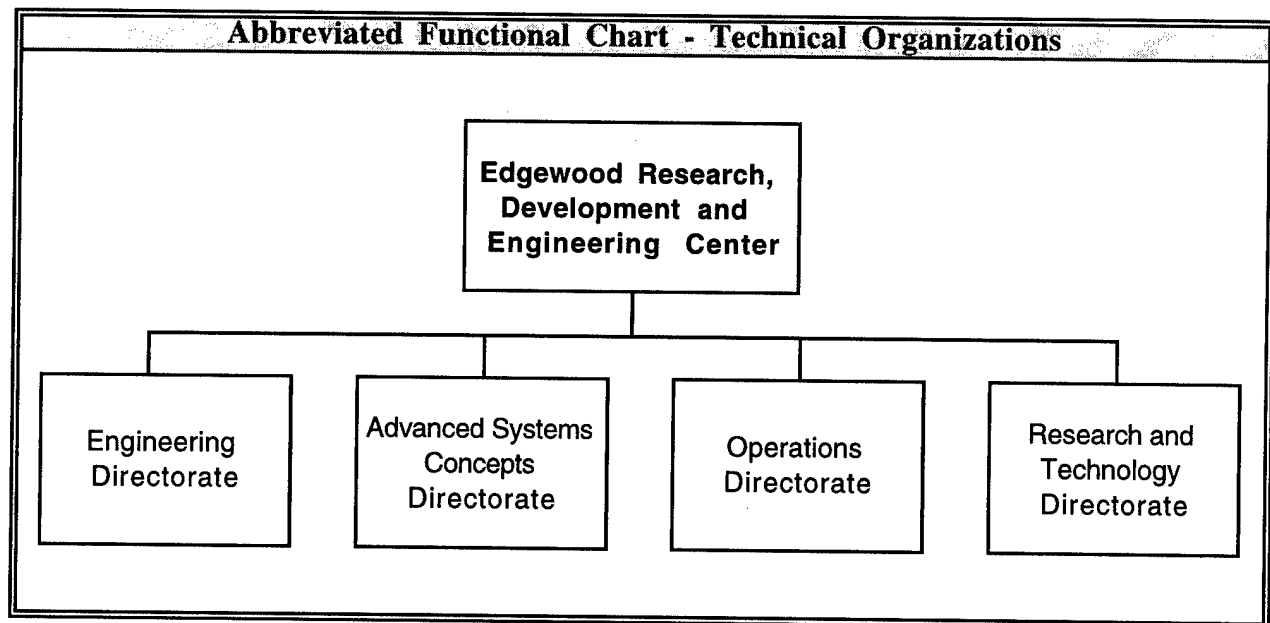
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	0	29	29
CIVILIAN	25	11	440	476
TOTAL	25	11	469	505

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	123.000	REAL PROPERTY	149.000
ADMIN	178.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	2,177.000	EQUIPMENT	8.000
TOTAL	2,478.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	798,855	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Edgewood Research, Development and Engineering Center



Edgewood Research, Development and Engineering Center

Aberdeen Proving Ground, MD 21010-5423
(410) 671-3838

Technical Director: Joseph J. Vervier

MISSION

A research, development and engineering center for executing the chemical and biological defense programs for the Army and the Joint Services (JS). Provide research, development and acquisition as well as life cycle engineering support for chemical/biological defense and smoke/obscurant equipment under DODD 5160.5. Act as DoD lead lab for the JS chemical/biological/smoke technology base. The Edgewood RDEC technical director is also the manager of the Edgewood NBC RDA Enterprise which includes PM NBC Defense Systems, PM Smoke/Obscurants, Program Director of Biological Defense Systems, and the Edgewood RDEC.

CURRENT IMPORTANT PROGRAMS

- Nuclear, Biological and Chemical (NBC) Reconnaissance, Detection and Identification.
- Individual and Collective Protection.
- NBC Decontamination.
- Smoke and Obscurants and Target Defeating Materials.
- Chemical Treaty Verification.
- Chemical and Biological Remediation.
- CB counterterrorism.

EQUIPMENT/FACILITIES

Major equipment is contained in a complex of R&D engineering/laboratory areas and includes: Process engineering facility; Production and facility design chamber for studies of respiratory protection design drivers; Simulant agent challenge test chamber; Rubber/elastomer mold facility; Specialized chemical agent labs; Pyrotechnic mixing, loading, handling facility; subsonic, supersonic, transonic wind tunnel; Complete analytical chemistry (trace analysis/tandem mass spectrometry); Obscurant test chambers for transmission measurements; Laser spectroscopy lab; Robotic toxic agent lab; CAD/CAE/CAM network; Super toxic facility; Design Evaluation Chemical Surety Lab; Decontamination/Detoxification Facility; Explosive test chamber; Toxic Dissemination Test Chamber; Inhalation Toxicology Laboratories; Molecular Modeling Facility; Microland Laboratory with electron microscopy and surface spectroscopy; Experimental Fabrication Facility; Nephelometry laboratory/Single Particle Laboratory; Smoke Breeze Tunnel; Controlled Environment; Soil-Core Microism Unit Chambers; Decontamination Test Facility.

Edgewood Research, Development and Engineering Center

Aberdeen Proving Ground, MD 21010-5423

Technical Director: Joseph J. Vervier

(410) 671-3838

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	1.597	N/A	1.597
6.1 Other	3.848	1.306	5.154
6.2	16.366	19.843	36.209
6.3	2.371	2.912	5.283
Subtotal (S&T)	24.182	24.061	48.243
6.4	28.560	47.085	75.645
6.5	26.456	38.981	65.437
6.6	4.690	5.032	9.722
6.7	0.417	0.103	0.520
Non-DOD	0.256	0.000	0.256
TOTAL RDT&E	84.561	115.262	199.823
Procurement	29.114	108.367	137.481
Operations & Maintenance	25.989	3.029	29.018
Other	30.842	2.060	32.902
TOTAL FUNDING	170.506	228.718	399.224

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

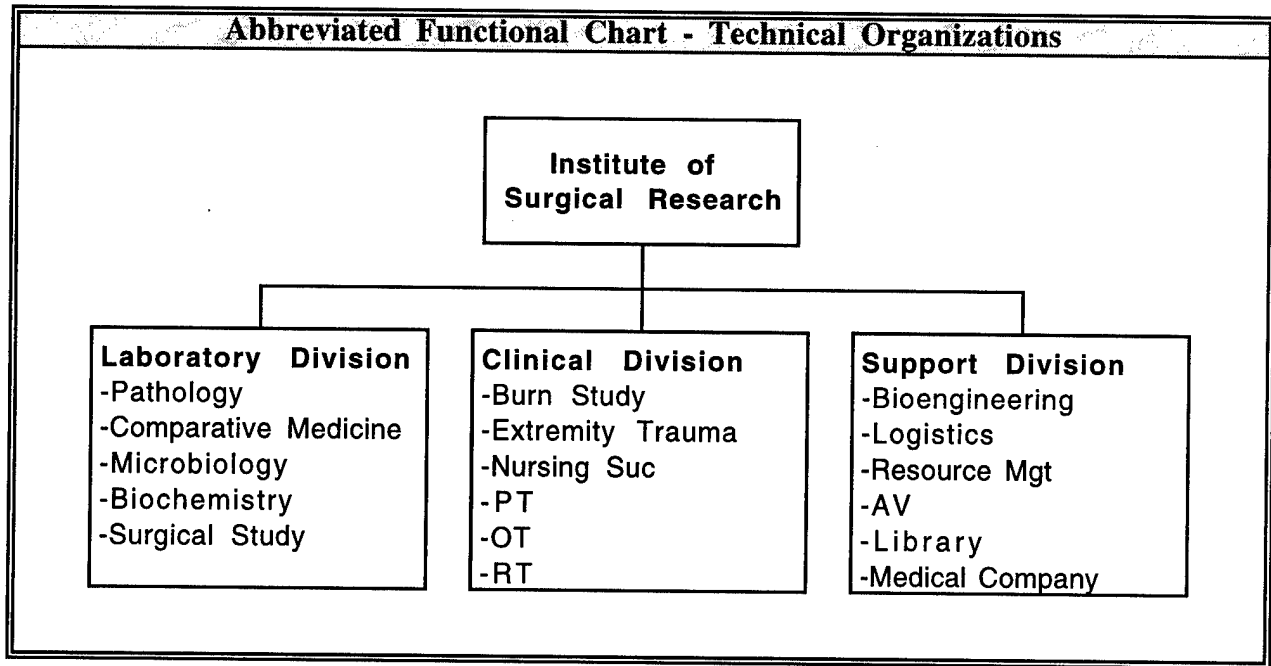
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	4	8	0	12
CIVILIAN	72	572	450	1,094
TOTAL	76	580	450	1,106

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	754.000	REAL PROPERTY	89.000
ADMIN	329.000	* NEW CAPITAL EQUIPMENT	1.000
OTHER	473.000	EQUIPMENT	137.865
TOTAL	1,556.000	* NEW SCIENTIFIC & ENG. EQUIP.	10.889
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Institute of Surgical Research



Institute of Surgical Research
Fort Sam Houston, TX 78234-6315
(210) 916-4819

Commander: COL Cleon Goodwin
Executive Officer: LTC Keith B. Parker

MISSION

Investigate problems of mechanical and thermal injuries with complications arising from such trauma; care for patients with such injuries; teach and train other personnel in injury research and management of injured patients; conduct investigative studies at both the basic and clinical levels.

CURRENT IMPORTANT PROGRAMS

At the center of research at USAISR is the Clinical Operations Protocol which supports the care of burn and mechanical trauma patients. Thermal injury is the only human model with a quantifiable disease (dose of injury: percent of total body surface area burned), which can be stratified into acceptable statistical designs. This unique setting provides a foundation for other clinical and laboratory research protocols that investigate the pathophysiology of trauma caused by burns and their complications. The clinical protocol assures delivery of standardized care essential for controlled clinical trials. The addition of the Extremity Trauma Program broadens this Institute's influence and expertise in the study of all types of trauma, including hemorrhage and resuscitation and secondary damage following hemorrhage and trauma. Another important program is the training of flight teams to provide prompt aero-medical transfer and care of injured soldiers. Taken together, this integration of physician-investigator and basic scientist allows for a foundation of basic science as well as applied science directly testable in trauma patients, and offers a highly focused, unique outcomes research program for the military.

EQUIPMENT/FACILITIES

USAISR has an equipment inventory of basic and clinical research equipment valued at over \$14,000,000. The institute has the 40 bed inpatient research unit of 50,300 square feet on the 4th floor of Brooke Army Medical Center and the laboratory located in an adjacent 84,000 sq ft. research facility dedicated in FY96. Capabilities include integrated clinical and laboratory research facilities and injured soldier test platforms; mass casualty burn care; aeromedical transport teams for multiple trauma victims, with specialty in burn injuries; a computerized database of over 40 years of data on injury-specific research subjects; metabolic study environmental chambers; comprehensive orthopedic and extremity trauma research staff and program; ballistics research laboratory; state-of-the-art animal operating suites; an electron microscopy suite; biocontainment suite for studying the effects of hazardous materials; materials testing apparatus and tissue engineering capabilities; and the only clinical evaluation/management trials facility for injured soldiers in the US military.

Institute of Surgical Research
Fort Sam Houston, TX 78234-6315
(210) 916-4819

Commander: COL Cleon Goodwin
Executive Officer: LTC Keith B. Parker

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.127	N/A	0.127
6.1 Other	0.581	0.000	0.581
6.2	6.655	0.000	6.655
6.3	0.176	0.000	0.176
Subtotal (S&T)	7.539	0.000	7.539
6.4	0.005	0.000	0.005
6.5	0.000	0.000	0.000
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	7.544	0.000	7.544
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	0.394	0.000	0.394
TOTAL FUNDING	7.938	0.000	7.938

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

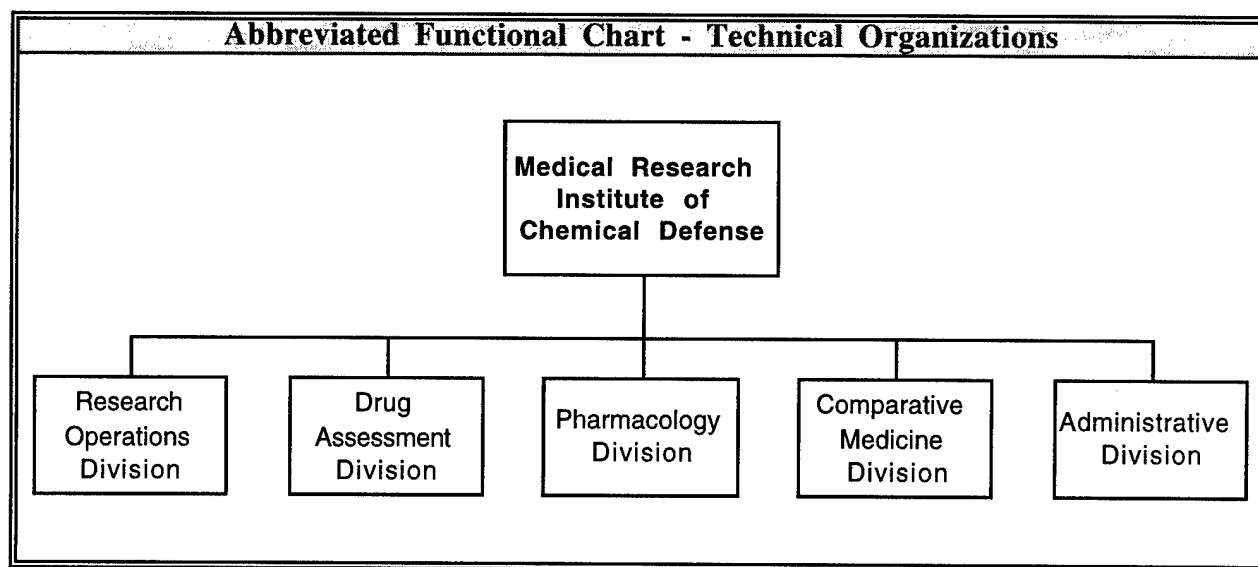
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	23	29	143	195
CIVILIAN	6	18	28	52
TOTAL	29	47	171	247

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	73.850	REAL PROPERTY	13.000
ADMIN	11.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	50.300	EQUIPMENT	13.000
TOTAL	135.15	* NEW SCIENTIFIC & ENG. EQUIP.	0.830
ACRES	1	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Medical Research Institute of Chemical Defense



Medical Research Institute of Chemical Defense
Aberdeen Proving Gr, MD 21010-5425
(410) 671-3276

Commander: COL James S. Little
Deputy Cdr: COL David H. Moore

MISSION

The U.S. Army Medical Research Institute of Chemical Defense is the Department of Defense's lead laboratory for the development of medical countermeasures against chemical warfare (CW) agents and responsible for training personnel on the medical management of chemical casualties. This mission includes: fundamental and applied research on mechanisms of action of CW threat agents, candidate pretreatment, treatment, and personal or skin decontamination compounds in order to establish a scientific and technical base from which to plan and formulate enhanced medical countermeasures to CW threats and to develop improved prevention and treatment modalities for CW casualties; test and evaluation of drugs, decontaminants, and medical equipment in development for the prevention, resuscitation, treatment, and management of chemical casualties; assistance in the integration of the concepts and products from these research, development, test, and evaluation mission activities into the logistical, doctrine and organizational development, and training systems; and training of both medical and non-medical personnel in the prevention and management of chemical casualties. In addition, the Institute has the mission to conduct research on medical defense against low molecular weight toxins.

CURRENT IMPORTANT PROGRAMS

Research programs at the Institute emphasize preservation of combat effectiveness by timely provision of medical countermeasures to chemical warfare (CW) agents in response to D.A. and DOD requirements. These programs maintain the technologic capability to meet present requirements and to counter future CW and neurotoxin threats, provide individual level prevention and protection against these threats, and enhance the medical management of CW and neurotoxin casualties, enhancing survival and expediting and maximizing return to duty.

The Institute conducts basic research, exploratory development, non-system development, and, on a reimbursable basis, advanced development of medical countermeasures for CW and neurotoxin agents, investigates the biomedical effects of CW agents, neurotoxins, and candidate medical countermeasures to these threats, conducts safety and efficacy studies of candidate pretreatment and prophylactic countermeasures, develops analytical technologies for medical countermeasures, and performs advanced research into CW and neurotoxin casualty care technology. We have met the FY96 objective to exploit the pathophysiological database and new technologies for prophylaxis and pretreatment to identify novel strategies to provide protection against vesicant injury, and are on target to meet the FY00 deadline to demonstrate safety and efficacy of a methemoglobin former for pretreatment against cyanide, and have made a milestone (MS) 1 transition of this product in FY95. The search for additional cyanide countermeasures is presently in technology watch. Our rapid progress in the development of mutant human butyrylcholinesterase variants as biological scavengers for nerve agents will enable the Institute to demonstrate by FY99 the safety and efficacy sufficient for a MS O transition of a new nontoxic antidote and/or pretreatment for nerve agents. Candidate advanced anticonvulsants are presently undergoing evaluation. We will demonstrate in FY97 the safety and efficacy sufficient for a MS O transition of the technology for an advanced anticonvulsant adjunct or component for the soldier/buddy-use nerve agent antidote.

CURRENT IMPORTANT PROGRAMS (continued)

The advanced anticonvulsant will overcome the deficiencies of the current anticonvulsant in that it will be more effective in stopping on-going seizures, in preventing their reoccurrence, and in protecting against nerve agent-induced, seizure-related brain damage, and will also demonstrate less abuse potential than the current anticonvulsant. Efforts to demonstrate by FY02 safety and efficacy sufficient for a MS O transition of the technology for a reactive topical skin protectant that will provide protection against penetration and will detoxify both vesicant and nerve CW agents are on track. This product will represent a significant increment in protection over the topical skin protection which is presently in advanced development.

The Institute has developed a pathophysiology database on respiratory agents which are currently in a technology watch. A Chemical Casualty Management effort which began in FY96 focuses on clinical issues impacting the presentation, diagnosis, progression, and medical management of CW casualties in the field. A MS 1/3 transition of a field cholinesterase diagnostic kit is expected in FY97, while a MS 0 transition of a methemoglobin monitoring kit will be achieved during FY97. During FY96, 19 courses on the Medical Management of Chemical Casualties were conducted where over 1700 students were trained. This includes training provided to local health care providers at the Olympic Games in Atlanta and the Democratic National Convention. The Institute also provided training to members of the 520th Theater Army Medical Laboratory on how to work with chemical warfare agents and on instrumentation and methods to detect these agents. Finally, considerable effort was expended on determining the effectiveness of our current medical countermeasures against several novel threat agents. The Institute maintained a total of 3 Cooperative Research and Development Agreements (CRDA) and 31 Material Transfer Agreements (MTA) at the end of FY96. One new CRDA and 15 new MTAs were executed during FY96.

EQUIPMENT/FACILITIES

The Institute's facilities support chemical casualty care training, physiology, drug assessment, pathophysiology, pharmacology, analytical chemistry, neurotoxicology, veterinary surgery, chemical safety/surety, medical maintenance, information and resource management, supply and quality assurance. A technical library with 6,000 books, 1,000 journal titles, and access to many databases is an integral part of our Institute. Video facility, computer facility and 7,000 SF animal facility also supports our researchers. Radioisotope chemical antidote and biochemical analysis, histochemistry, behavioral testing, drug screening, pharmacokinetics, molecular modeling, liquid, gas, column and affinity chromatography, quantitative image enhancement/analysis, electrophoresis, spectroscopy, fluorometry and spectropolarimetry, GC mass spectrometry, electron spin resonance and peptide synthesis/sequencing, amino acid analysis, monoclonal haptent antibodies, electron scanning and X-ray microscopy, cell cloning, and receptor analysis are also supported.

EQUIPMENT/FACILITIES (continued)**Major Facilities and Equipment:**

Building E-3100: Main Medical Chemical Defense Research Laboratory and Administrative Building.

Building E-3081: Unique to DOD. Contains a Chemical Surety Materiel Laboratory for Medical Chemical Defense Research.

Building E-3156: Large Animal Holding/Chemical Research Facility.

Building E-3244: Biotxin Research Facility.

Building E-3103/E-3106: Chemical Casualty Care Training Facility.

Building E-3103/Classroom: Chemical portion of the Management of Chemical and Biological Casualties Course (6H-F26) is conducted here.

Building E-3101: Administrative Facility: Surety, Safety, Environment, and Contract Management.

Hazardous Materiel Storage and 90-Day Hazardous Waste Sites: These sites meet stringent specifications which conform to the environmental requirements for the storage and disposition of chemicals and hazardous materials.

Building E-3105: Information Management Support Facility.

Building E-3107: Equipment Turn-in Facility.

Building E-3104: Environmentally Controlled Building for Electronic Equipment.

Building E-2180: Equipment Storage and Turn-in Facility.

Building E-3083: Equipment storage for Medical Chemical and Biological Casualties course.

Building E-5244: Environmentally Controlled Tape and Electronic Storage Facility.

Building E-5826: Animal Care Equipment Storage Facility.

Building E-3221: Hazardous Waste Storage Facility.

Direct Digital Control HVAC System: System provides constant control and 24-hour remote monitoring of chemical fume hoods in the Surety Area of building E-3081, controls HVAC throughout remainder of laboratories and administrative areas, and controls and remotely monitors all animal rooms in buildings E-3081, E-3100, E-3156, and E-3244.

Walk-in Coolers in Building E-3081, E-3100: Storage of chemicals used for research.

Chillers, Building E-3081: Installed in 1994 to meet EPA requirements. Each unit produces 350 tons of cooling using 123 refrigerant.

Chillers, Building E-3100: Installed in 1994 to meet EPA requirements. Each unit produces 350 tons of cooling using 123 refrigerant.

EQUIPMENT/FACILITIES (continued)

Medical Waste Incinerator: Required to burn animal bedding, carcasses, and medical waste generated by the Institute

Air Compressor: Required to supply laboratories with bench air for research.

Chemical/Biological/Radiological (CBR) Filter Trains: Provided for all 77 chemical/biological hoods located in buildings E-3100, E-3081, and E-3244. Each CBR filter train consists of a housing unit containing prefilter, as well as the appropriate number and size of High Efficiency Particulate (HEPA) and High-Efficiency Gas-Phase Absorber (HEGA) filters. All filter trains are in support of the Chemical/Biological Defense Program and are in compliance with Environmental Protection Agency, State, and Federal Standards.

Exterior Walk-in (adjacent Bldg E-3100): Storage of animal carcasses prior to incineration.

Auxillary Chillers (E-3100): Provides renovated laboratories with additional cooling to support electronic equipment.

Decontamination Showers Required to conduct research in accordance with regulations.

Building E-3156/Associated Animal Pens and rooms: Quarantine area for newly arrived large animal species. Required for the care of animals used in research.

House Water Distillation System (Bldgs E-3100, E-3081, E-3244): This central system feeds water to satellite polishing systems in the individual laboratories. Pure laboratory water is needed in virtually all segments of laboratory research. High-purity water is used for reagent buffers and sensitive instrumental analyses (such as High Pressure Liquid Chromatograph, Gas Chromatograph/Mass Spectrometer, as well as inwashing and/or preparing biological solutions such as media for tissue culture.

Hazardous Materiel and 90-Day Hazardous Waste Sites: These sites meet stringent specifications which conform to the environmental requirements for the storage and disposition of chemicals and hazardous materials.

Emergency Generator (Bldg E-3100): Provides emergency power for lighting, freezers, incubators, and other specialized equipment which must remain operational.

Administrative and Laboratory Emergency Generator (Bldg E-3081): Provides emergency power for lighting, freezers, incubators, and other equipment which must remain operational.

Surety Area Back-up Generator (Bldg E-3081): Supplies emergency power to the entire chemical surety wing to include all fume hoods, heating, ventilation and air conditioning systems, and electrical systems.

Uninterruptable Power System (UPS) (Bldg E-3081): System supplies immediate power to the fume hood exhaust blowers in the chemical surety area until the emergency generator starts and transfers power.

Surety Area Holding Tanks (Bldg E-3081): Consists of two 10,000 gallon tanks which hold all waste water generated in the surety wing. This ensures that chemical spills will not escape into the sanitary sewer.

Medical Research Institute of Chemical Defense
 Aberdeen Proving Gr, MD 21010-5425
 (410) 671-3276

Commander: COL James S. Little
 Deputy Cdr: COL David H. Moore

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.060	N/A	0.060
6.1 Other	2.906	3.871	6.777
6.2	10.269	1.842	12.111
6.3	2.571	9.402	11.973
Subtotal (S&T)	15.806	15.115	30.921
6.4	0.376	0.000	0.376
6.5	0.023	0.000	0.023
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.875	0.000	0.875
TOTAL RDT&E	17.080	15.115	32.195
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	1.234	0.000	1.234
TOTAL FUNDING	18.314	15.115	33.429

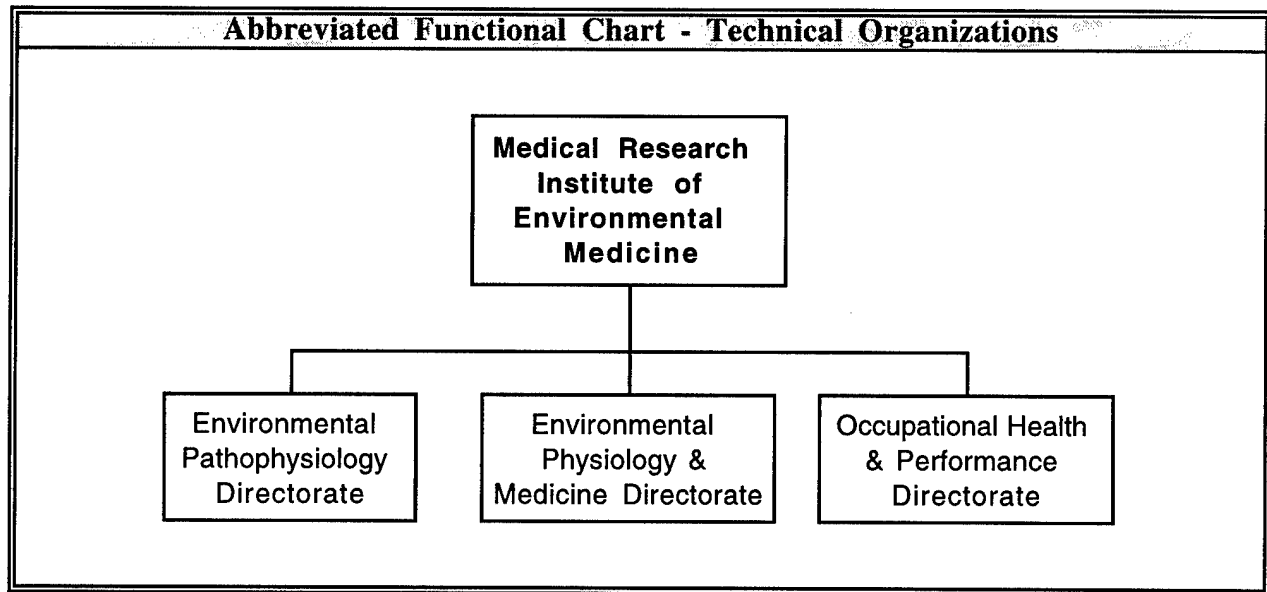
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	22	3	26	51
CIVILIAN	33	23	95	151
TOTAL	55	26	121	202

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	37.419	REAL PROPERTY	23.400
ADMIN	38.433	* NEW CAPITAL EQUIPMENT	0.113
OTHER	125.024	EQUIPMENT	0.032
TOTAL	200.876	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	30	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Medical Research Institute of Environmental Medicine



Medical Research Institute of Environmental Medicine

Natick, MA 01760-5007
(508) 233-4811

Commander: COL Joel T. Hiatt
Executive Officer: MAJ Mary L. Ramos

MISSION

Conduct research to determine the effects of environmental stresses (e.g. heat cold, high terrestrial altitude), nutrition and work requirements upon the soldiers' health and performance.

Conduct basic and applied research in the areas of environmental sentinel and alternative toxicity assessment model development and the development of new analytical methodologies. Provide R&D and consultation services in the areas of environmental toxicology hazard and risk assessment to the Army and other Federal and non-Federal activities.

CURRENT IMPORTANT PROGRAMS

Environmental Injury: Demonstrate the efficacy of strategies to predict, prevent and treat environmental illnesses, injuries and performance decrements.

Performance Limits: Develop and validate models to predict the effects of heat, cold, high altitude, hydration, nutrition status and clothing and equipment on performance.

Nutritional Strategies: Identify and demonstrate nutritional strategies to maintain health and enhance soldier performance.

Musculoskeletal injuries and physical performance: Demonstrate the efficacy of methods to reduce the incidents of musculoskeletal injuries and optimize performance during military training and operations. Special emphasis is being placed on Defense Women's Health Research.

Warfighter Physiological Status Monitor: Develop ambulatory monitoring instruments to assess the physiological status of the individual soldiers.

Medical Chemical Defense: Investigate/define mechanism(s) of vesicant injury. Deployment of toxicology methods (bioassay and biomonitoring system; integrated environmental assessment of chemically contaminated sites at Army installations; development of non-mammalian models for assessment of toxic hazards).

EQUIPMENT/FACILITIES

The major equipment and facility capabilities of the Institute include, but are not limited to, two large altitude chambers, fourteen small climatic chambers, including four recently refurbished large stainless steel chambers with independent environmental controls, state-of-the-art clean room, a human psychology laboratory, and a biomechanics laboratory developed jointly with the U.S. Army Natick Research, Development and Engineering Center, American Association for Accreditation of Laboratory Animal Care (AAALAC), accredited animal care facilities, ACAS laser cytometer, underwater research pool, copper manikins and diverse pharmacological and physiological measuring equipment. The Institute maintains a field facility on the summit of Pikes Peak. At the Environmental Toxicology Laboratory in Maryland - Aquaculture and Aquatic Toxicology Laboratories and Immunotoxicology laboratories and Immunotoxicology laboratory and mobile analytical chemistry laboratories and lab facilities at Colorado State University.

Medical Research Institute of Environmental Medicine

Natick, MA 01760-5007

(508) 233-4811

Commander: COL Joel T. Hiatt
Executive Officer: MAJ Mary L. Ramos

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.060	N/A	0.060
6.1 Other	2.500	0.905	3.405
6.2	5.547	0.859	6.406
6.3	0.008	0.000	0.008
Subtotal (S&T)	8.115	1.764	9.879
6.4	0.003	0.000	0.003
6.5	0.000	0.000	0.000
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	8.118	1.764	9.882
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	2.096	1.218	3.314
TOTAL FUNDING	10.214	2.982	13.196

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

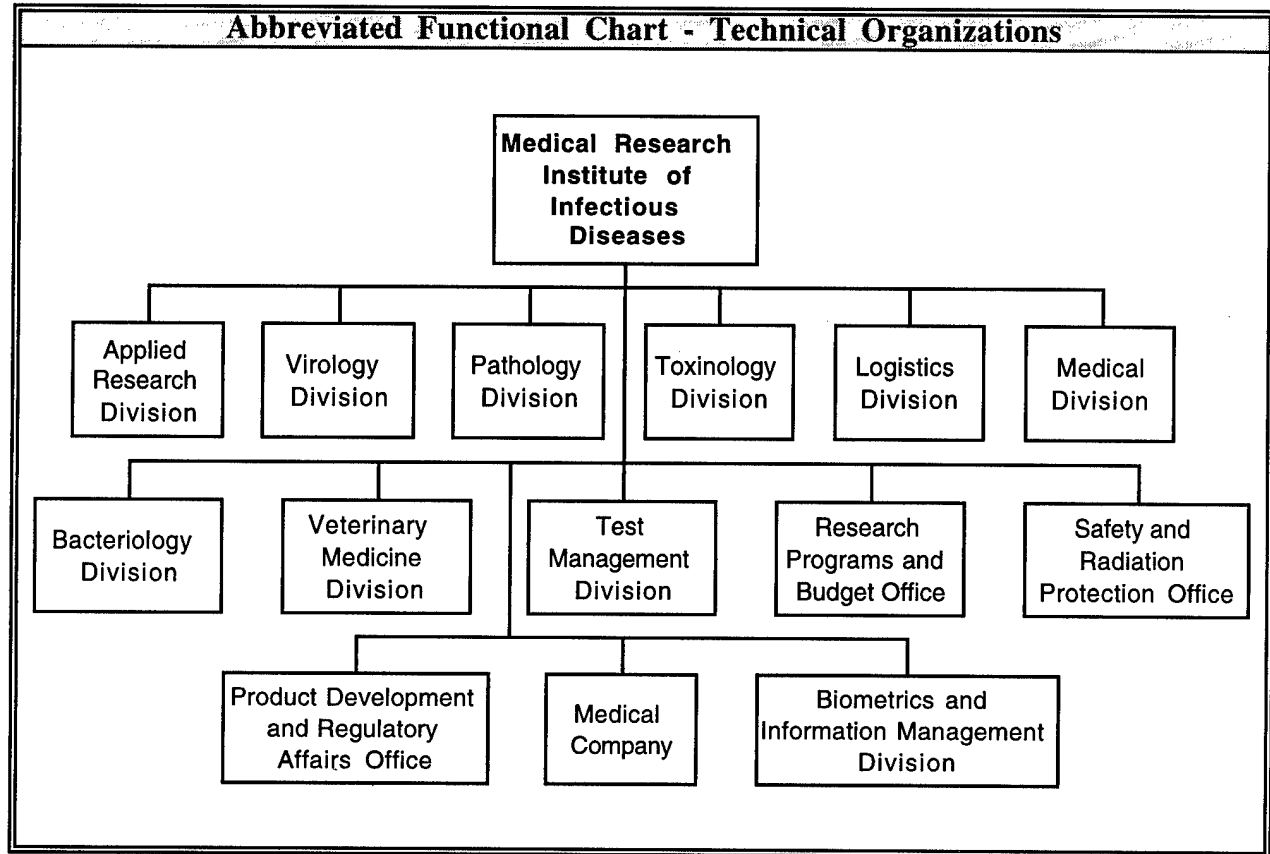
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	20	1	43	64
CIVILIAN	29	28	32	89
TOTAL	49	29	75	153

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	93.676	REAL PROPERTY	25.505
ADMIN	10.869	* NEW CAPITAL EQUIPMENT	0.000
OTHER	9.423	EQUIPMENT	30.947
TOTAL	113.968	* NEW SCIENTIFIC & ENG. EQUIP.	0.378
ACRES	1	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Medical Research Institute of Infectious Diseases



Medical Research Institute of Infectious Diseases

Fort Detrick, MD 21702-5011
(301) 619-2833

Commander: COL David R. Franz
Senior Research Scientist: Dr. Peter B. Jarling

MISSION

To conduct research to develop strategies, products, information and training for medical defense against biological warfare threats and against naturally occurring infectious agents of military importance that require special containment. The Institute is the lead laboratory in the Medical Biological Defense Research Program and participates in crucial aspects of the Infectious Disease Research Program.

CURRENT IMPORTANT PROGRAMS

Development of medical countermeasures for biological warfare threats continues to be the highest mission priority. New vaccine candidates for plague, anthrax, staphylococcal enterotoxins A & B, Venezuelan equine encephalitis, and botulinum toxins have been generated using genetic engineering approaches and are in various stages of advanced preclinical testing. An intensive research program in orthopox viruses was initiated to determine comprehensive diagnostic approaches for this group of viruses, identify effective antiviral drugs, and assess the efficacy of the existing vaccine for smallpox in protection against aerosol exposure to monkeypox virus. Highly promising results in the development of vaccines and antiviral drugs for the filoviruses such as Ebola and Marburg were obtained. In FY96 USAMRIID established a new office, Product Development and Regulatory Affairs, for implementation of Good Laboratory Practices in accordance with Food and Drug Administration regulations. This office is coordinating a critical study of the anthrax vaccine to determine if fewer doses than required by the licensure documentation would provide adequate protection. Diagnostic assays for confirmatory tests received high priority, with a systematic approach to standardizing procedures and addressing significant biological warfare and infectious disease threats. Two new programs directly targeting enhanced readiness of the force and the nation were initiated in FY96. To increase our capability to train military health-care providers in the Medical Management of Biological Casualties, a distance-learning program and a compact disk training system have been initiated. Both efforts should be completed late in FY97. USAMRIID also is recognized as an important national resource for support in countering biological terrorism. A formal response team was established to assist other responsible agencies in threat analysis, medical consultation, training, field and reference laboratory sample analysis and evacuation of patients with highly hazardous disease under containment conditions.

EQUIPMENT/FACILITIES

Three buildings provide 347,000 square feet with approximately 15% of the laboratory space capable of operations at biosafety level 3 and approximately 3% capable of operations at biosafety level 4 (maximum containment). These containment laboratories are a unique international resource for the safe study of high hazard disease agents, and are the only such laboratories within the DOD. Other unique facilities include: a 16-bed clinical research ward; high containment patient care facility and support functions; containment patient care facility and support functions; contained dynamic aerosol laboratory exposure systems; cell culture and hybridoma laboratory; and electron microscopy equipment. The laboratory facilities also include a small farm for the care and housing of large animals used in research.

Medical Research Institute of Infectious DiseasesFort Detrick, MD 21702-5011
(301) 619-2833Commander: COL David R. Franz
Senior Research Scientist: Dr. Peter B. Jarling

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	1.239	N/A	1.239
6.1 Other	7.330	0.000	7.330
6.2	8.637	0.000	8.637
6.3	5.172	0.000	5.172
Subtotal (S&T)	22.378	0.000	22.378
6.4	0.303	0.000	0.303
6.5	0.091	0.000	0.091
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	22.772	0.000	22.772
Procurement	0.000	0.000	0.000
Operations & Maintenance	2.048	0.000	2.048
Other	0.062	0.000	0.062
TOTAL FUNDING	24.882	0.000	24.882

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

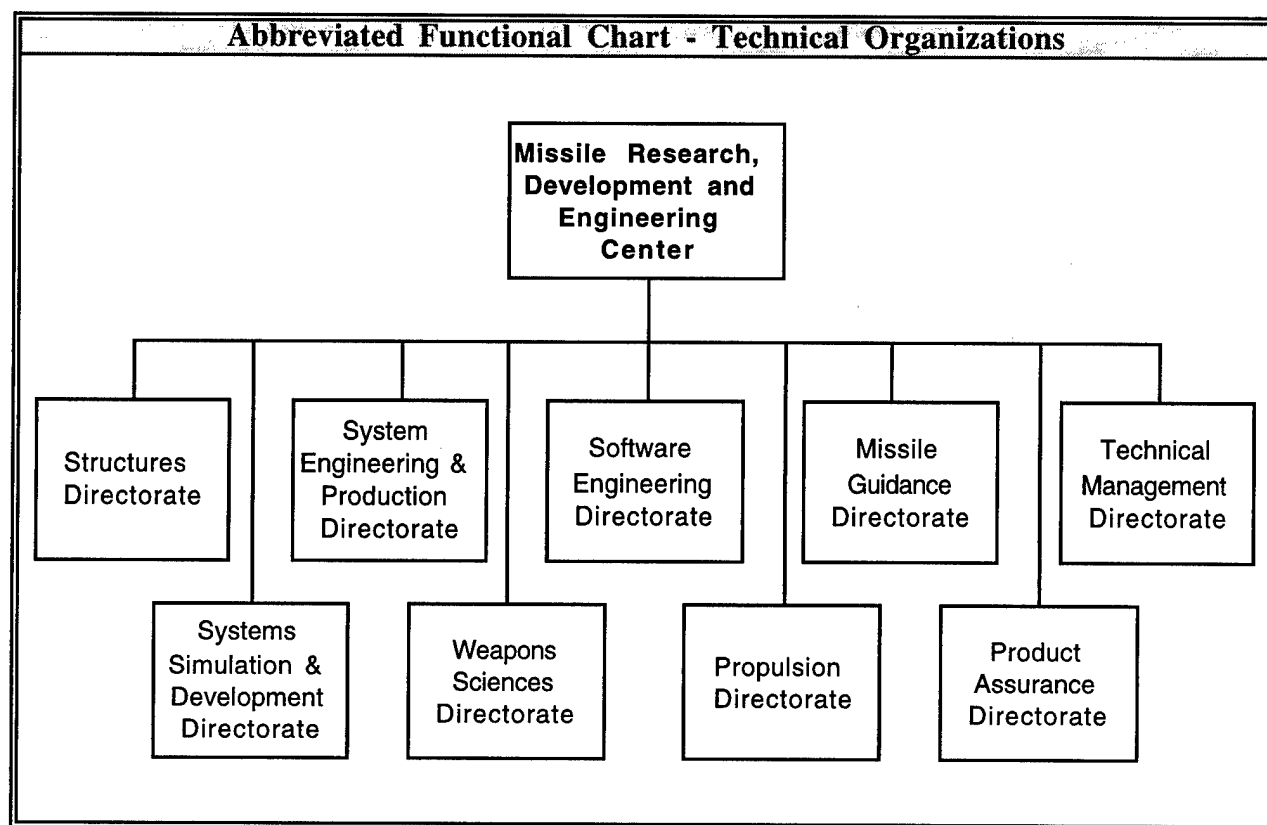
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	42	5	199	246
CIVILIAN	48	41	113	202
TOTAL	90	46	312	448

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	121.000	REAL PROPERTY	23.962
ADMIN	78.000	* NEW CAPITAL EQUIPMENT	1.500
OTHER	148.000	EQUIPMENT	42.578
TOTAL	347.000	* NEW SCIENTIFIC & ENG. EQUIP.	1.653
ACRES	150	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Missile Research, Development & Engineering Center



Missile Research, Development & Engineering Center

Redstone Arsenal, AL 35898-5241
(205) 955-6805

Tech. Director: Dr. William C. McCorkle
Assoc. Director: Dr. Richard G. Rhoades

MISSION

To plan, manage and conduct research, exploratory and advanced development for guided missile and rocket weapon systems and related components; to provide scientific, engineering, and technical support for weapon system programs over the complete life cycle; and to manage computer resources embedded in battlefield automated systems. MRDEC provides the technical expertise to enable the services to be smart buyers and users of missiles, rockets, unmanned vehicles and their unique command and control systems, directed energy, non-lethal technology, computer resources embedded in battlefield automated systems, and related models and simulation and, as such, is an essential part of the acquisition process.

MRDEC's science and technology base mission includes planning, managing, and conducting research, advanced development, and exploratory investigation in response to Army system needs. MRDEC's national defense mission includes mutually beneficial relationships with the private sector for those areas where parallel paths should be and can be reduced by cooperation. MRDEC's life cycle systems engineering mission includes planning, establishing, and managing the Missile Command programs to develop new weapon systems, evaluate system and subsystem performance, and maintain high readiness status, assure effectiveness of fielded systems, and control both acquisition and O&S costs. Selective research and component development is conducted to generate new manufacturable technology, reduce development lead time and system cost, and improve reliability.

MRDEC is the Army's lead organization for technologies in missile propulsion, guidance and control/terminal homing, high energy lasers, missile systems simulation, and unmanned vehicles. MRDEC is the System Integrator for the Joint Program Office for Unmanned Aerial Vehicles. MRDEC has the DoD Lead in the Rapid Force Projection Initiative (RFPI), a major Advanced Concept and Technology Demonstration (ACTD) that includes AMC-wide simulation/demonstration/residual support. In addition, MRDEC is the lead Center within the U.S. Army Materiel Command for the Early Entry, Lethality, and Survivability Battle Lab at Fort Monroe, Virginia.

VISION: Weapon System Technology for Swift Decisive Victory without Casualties.

STRATEGIC GOALS:

1. Demonstrate feasibility of new systems concepts that significantly enhance warfighting capabilities by integration of enabling technology into demonstration efforts.
2. Focus the science and technology base on the new realities.
3. Increase market share: broaden the marketplace.
4. Improve the responsiveness, affordability, and quality of MRDEC products and engineering services.

ENABLING STRATEGIES:

1. Keep workforce fully engaged in state-of-the-art technology work to preserve capability as smart buyer.
2. Develop a superior workforce and a quality environment.

CURRENT IMPORTANT PROGRAMS

Ducted Rocket Engine (DRE) - This effort is a joint research and development program with Japan to develop and demonstrate a ducted rocket engine for medium surface-to-air missile to significantly increase the intercept envelope against aircraft, cruise missiles, and tactical ballistic missiles when compared to surface-to-air missiles using current solid rocket propulsion technology.

Multimode Airframe Technology (MAT) (formerly known as Long Range Fiber Optic Guided Missile (LONGFOG)) - This program will provide a 40 km day/night, multiple and high value time sensitive point target strike capability while inflicting minimum collateral damage. The LONGFOG system will provide the capability to select priority targets after launch, conduct limited man-in-the-loop BDA, and provide target area reconnaissance in addition to target attack by means of variable cruise velocity over areas of interest.

Future Missile Technology Integration (FMTI) (formerly known as The Army Combined Arms Weapon Systems (TACAWS)) - This project provides for the demonstration of advanced tactical missile technologies including seekers, propulsion, airframes, warheads, and guidance and control. The project will demonstrate lightweight multi-role missile technology in support of ground-to-ground, ground-to-air, air-to-air, and air-to-ground missions. Combined, flexible capability allows one system or variants of one system to replace many, realizing potential extensive savings in development costs, logistics, training, etc. The FMTI demonstration program will transition technology to the TOW Follow-on Engineering and Manufacturing Development (EMD), (Follow-on-to-TOW (FOTT)) program beginning in FY96/97, the EFOG-M ATD program in FY97/98, and the Joint Advanced Weapons System (JAWS), an Army/Marine Corps multi-purpose, multi-platform missile.

Guided MLRS ATD - This program will demonstrate a low cost guidance and a control package for the MLRS rocket. At extended ranges, large quantities of baseline rockets are required to defeat the target. With the addition of a guidance system, an improved delivered accuracy will be achieved. The number of rockets required to defeat the target will be reduced to one-sixth the current quantity at maximum ranges.

Rapid Force Projection Demonstration - The integrated system of systems concept of the ACTD provides lightweight, responsive precision fires to destroy threat armor forces during day, night, and adverse weather. This ACTD will evaluate the value added by the insertion of these new technologies into the force structure of an existing light unit in a lift constrained environment. The inserted systems will consist of forward sensors (hunters), advanced C2, and a suite of standoff killers.

Compact Kinetic Energy Missile (CKEM) Technology - This project demonstrates the compact kinetic energy missile technology necessary for a LOSAT P3I. The LOSAT P3I will match the lethality of the LOSAT while reducing the LOSAT take off weight by 40-50%, missile diameter by 20%, minimum range to peak velocity by 40-50%, and provide the maneuver capability required to destroy attacking fixed and rotary wing aircraft. Compatible with the LOSAT target acquisition and tracking system and could be compatible with the fire control system for close combat and short range air defense missions.

Low Cost Precision Kill (LCPK) 2.75' Guided Rocket - This project provides for demonstration of a low cost, accurate (1-m CEP) guidance and control retrofit package for the 2.75' Hydra-70 rocket that provides a stand-off range for a high single shot probability of hit ($Ph > \text{or} = 0.7$) against the long range target, exceeding the current unguided 2.75' rocket baseline by 1 or 2 orders of magnitude and thereby providing a 4 to 1 increase in stowed kills at 1/3 the cost per kill compared to current guided missiles. The increased accuracy will minimize collateral damage, reduce risk of fratricide, and will reduce mission times and sorties resulting in increased system survivability. Two separate retrofit guidance package approaches, one based on a solid state (strapdown) mechanization of semi-active laser (SAL) guidance, and the other, based on a potentially much lower cost innovative laser beam follower mode of guidance denoted Scatterider, will be developed and tested in parallel,

CURRENT IMPORTANT PROGRAMS (continued)

with user participation, to assure the most cost effective solution is obtained in the neckdown to one system for the transition to EMD.

Counter Active Protection Systems (CAPS) - This project develops and demonstrates technologies which can be applied to Anti Tank Guided Weapons (ATGW) for improving their effectiveness against threat armor equipped with Active Protection Systems (APS). Current technology development is concentrated in the following areas: Radio Frequency (RF) Countermeasure (RFCM) technology for jamming or deceiving APS sensors used for detection, acquisition, and tracking; warhead integration and ballistic hardening of ATGW to reduce vulnerability to fragment impact.

Cooperative Research and Development Agreements (CRDAs):

COMPANY: Sy Technologies, Inc. DURATION: 5/94 through 1/96
SUBJECT: Development and analysis of designs, and fabrication and test of these designs of binary optic elements for use in unique state-of-the-art optical systems.
PAYOFF: Reduction in costs, increase in reliability and performance of optical elements used in Army missile and optics systems.

COMPANY: Rockwell International Corp. DURATION: 3/94 through 1/97
SUBJECT: Development and verification of advanced analytical design methodology and design tool that optimizes the structural performance directly to the manufacturing process.
PAYOFF: Acceleration of the use of lightweight, high strength structures in the development of advanced Army missile systems and aircraft.

COMPANY: Signature Products DURATION: 3/94 through 1/97
SUBJECT: Increasing the production rate and improving the C(60) reactor process for Radar Absorbing Materials (RAM)
PAYOFF: Increasing efficiency (higher impulse) in missile propulsion systems

COMPANY: Optical Processing Technology Systems DURATION: 3/95 through 9/97
SUBJECT: Development of components and algorithms required for demonstration of a diverse pattern recognition system using optical processors.
PAYOFF: High throughput, smaller size, lower power consumption, lower cost per processors and greater image fidelity.

COMPANY: Hughes Missile Systems DURATION: 5/95 through 12/96
SUBJECT: Development of a comprehensive Tolerance Optimization and Variability Reduction (TOVAR) process and methodology model that can be integrated into both product development and production processes.
PAYOFF: Increased production yields, lower production costs, and increased product reliability and robustness.

COMPANY: Optical Corp of America DURATION: 4/96 through 9/97
SUBJECT: Developing a computer board (using miniature optical correlators) with user software that is able to perform high-end image processing.
PAYOFF: Provide next generation image processing far superior to current image processing and the associated algorithms.

COMPANY: Puritan Lace, Inc. DURATION: 9/96 through 12/96
SUBJECT: Pattern recognition algorithms and software development that is able to recognize a lace pattern laser cut the excess lace from the product.
PAYOFF: Increase understanding of very low contrast imagery and development of algorithms that can differentiate and recognize established patterns.

CURRENT IMPORTANT PROGRAMS (continued)

COMPANY: Rochester Photonics Inc. DURATION: 9/96 through 5/99

SUBJECT: Develop and evaluate techniques of direct E-beam fabrication for diffractive optical components and perform replication studies.

PAYOFF: Enhance the reliability and yield for production of optical components.

COMPANY: Georgia Tech Research Corporation DURATION: 11/92 through 1/99

SUBJECT: Development of advanced manufacturing processes and equipment in the areas of microelectronics and photonics.

PAYOFF: Reduction in the production costs of military systems microelectronics and photonic components.

Technology Transfer Highlights:

Three new Cooperative Research and Development Agreements (CRDAs) were approved during FY96, and one existing CRDA was amended and extended through FY99: One CRDA was signed with Rochester Photonics to develop techniques of direct E-beam fabrication to diffractive optical components and performance of replication studies; a second CRDA was signed by Optical Corporation of America to develop a logic board using miniature optical correlator with high-end image processing software, and the third CRDA was signed by Puritan Lace Inc. to develop lace pattern recognition algorithms and develop laser tracing and cutting technology. The signing of the above three new CRDAs along with extending the one existing CRDA brought the total to ten (10) active CRDAs for FY96.

Eighteen (18) Domestic Technology Transfer Awards were presented by the MRDEC Director. These awards were given to each outstanding contributor toward their efforts to bring MRDEC technologies to the commercial market place. Areas of particular noteworthiness were the efforts of the Weapons Sciences Directorate for their work in photo optics, the Propulsion Directorate for their efforts toward rocket propellant demilitarization and reuse, and the Systems Simulation and Development Directorate for their efforts in SADARM sensor simulation.

EQUIPMENT/FACILITIES

Propellant Aging and Mechanical Properties Facility - This is the most modern facility in the world dedicated to solid rocket motor structural integrity and service life extension investigation. Completed in 1988, it meets DoD's latest safety requirements for handling hazardous propulsion materials.

Gel Propellant Rheology Facility - This facility is used to determine rheological properties of gelled propellants throughout the Army operational temperature limits and for shear rates higher than those imposed on the gels by engine injectors. This information is required to minimize the volume and weight of gel propulsion systems.

Ducted Rocket Test Facility - This is the most modern, economical, direct connect air facility in the world and is used for testing ducted rockets and ramjets. Completed in 1995, it utilizes state of the art computer control to deliver a wide range of air flow rates and temperatures during a single test run, in effect 'flying' a mission while on the test stand.

Target and Seeker Measurement Facility (TSMF) - Used by the Army and Air Force for sensor/seeker design measurements, this facility includes a 300 foot tower and elevator combination allowing an operator access to equipment at any elevation up to the maximum. It also includes a 70 ton capacity target turntable with multiple degrees of freedom.

EQUIPMENT/FACILITIES (continued)

Advanced Simulation Facility - This facility is unequalled in the free world providing hardware-in-the-loop-simulation. Consisting of 10 hardware-in-the-loop simulation facilities, the Center provides unique capabilities for closed guidance loop system performance evaluation in a laboratory environment of missiles and submunitions guided and/or fuzed by: microwave and millimeterwave radar; scanning and staring infrared sensors; other electro-optical signals; and by inertially sensed motion. Its international reputation is demonstrated by previous and on-going international programs and consultations with the countries of Australia, Belgium, France, Germany, Israel, Korea, and the United Kingdom.

The MICOM DIS Center - This facility provides ten interconnected application rooms for the development and operation of virtual prototype simulators, multiple local area networks, and supporting hardware and software essential to the conduct of DIS exercises. It houses the node, or gateway, to the Defense Simulation Internet and an extensive WAN which includes HWIL simulations, weapons system hardware, and virtual prototypes of systems.

The Battlefield Environment Weapon System Simulation Test Bed (BTB) - This facility is a DIS compliant laboratory network of the areas of weapon system developers in the areas of weapon system design and effectiveness studies. It provides the infrastructure necessary to link live, virtual and constructive elements in common synthetic environments.

Guidance and Control Analysis Facility - An all digital facility for check out of flight systems, this capability is unprecedented in its system bandwidth. It is currently used for real time check out of extremely high bandwidth ADKEM guidance and control components.

Anechoic RF Test Chamber - This facility is world renowned for its wide anechoic bandwidth and physical size. A specially designed floor provides realistic simulation of surface wave propagation - a unique capability.

Fire Support System Integration Lab - Designed for end-to-end weapon system hardware check out, this facility contains distributed, netted communication nodes which can perform high and low level system tests. The facility is currently uniquely configured to check out the MLRS family of munitions.

Army Missile Optical Range - A one of a kind, very large aperture (2m) compact laser range capable of illuminating large targets, under simulated far field conditions, at short range. This facility is used extensively for measurement of Strategic Defense Targets.

UAV System Integration Laboratory - A world class facility unique in its ability to integrate multiple UAV systems and test common subsystem integration interfaces.

Air Defense Interoperability Test Facility - Designed for weapon system software check out, this is the only facility in the U.S. Government having, in residence, all Army deployed tactical air defense systems (Patriot, FAAD C2, AN/TSQ-73, HAWK with radars, and THAAD currently under development) and regularly conducts inter-Service and intra-Army testing.

Composites Manufacturing Facility - Wholly Government owned and operated, the Composites Manufacturing Facility provides MRDEC engineers with a 'hands on' capability in missile composites manufacturing from project concept, through fabrication, and testing. This facility is the Government's principal repository of technical expertise in this area.

Propellant Signature Characterization Facility - This environmentally controlled 'smoke tunnel' is used by all Services to evaluate contractor propellants and conduct detailed analysis of propellant insensitive munition properties.

Automated Manufacturing Cells - Contains a uniquely automated, fiberoptic winding capability and

EQUIPMENT/FACILITIES (continued)

a cell for automated inspection of printed circuit boards down to 1-2 mils line width.

Laser Induced Chemistry Facility - Unique facility which includes lasers covering ultraviolet to infrared and analytical instrumentation to identify compounds resulting from laser induced reactions.

Laser Range - The Physical Sciences Building was designed for high energy laser operation. A laser range was built behind the building which allows the operation and use of the range from inside the building either by the hi-bay or directly from the lab. The range is approximately 1720 ft long with four islands each with a large mirror mount and electricity. A concrete bridge designed to support an M1 tank connects the islands with the hi-bay area. Access to the range is restricted by chain link fence and interlocks on the interior doors. Warning lights are positioned down the centerline of the range and on the access doors and gates.

Missile Research, Development & Engineering Center

Redstone Arsenal, AL 35898-5241

(205) 955-6805

Tech. Director: Dr. William C. McCorkle

Assoc. Director: Dr. Richard G. Rhoades

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	1.019	N/A	1.019
6.1 Other	0.009	0.974	0.983
6.2	10.915	21.230	32.145
6.3	18.025	160.749	178.774
Subtotal (S&T)	29.968	182.953	212.921
6.4	14.526	18.716	33.242
6.5	14.905	33.442	48.347
6.6	4.530	34.126	38.656
6.7	10.801	14.625	25.426
Non-DOD	0.020	0.000	0.020
TOTAL RDT&E	74.750	283.862	358.612
Procurement	48.285	53.237	101.522
Operations & Maintenance	12.999	16.560	29.559
Other	11.617	22.372	33.989
TOTAL FUNDING	147.651	376.031	523.682

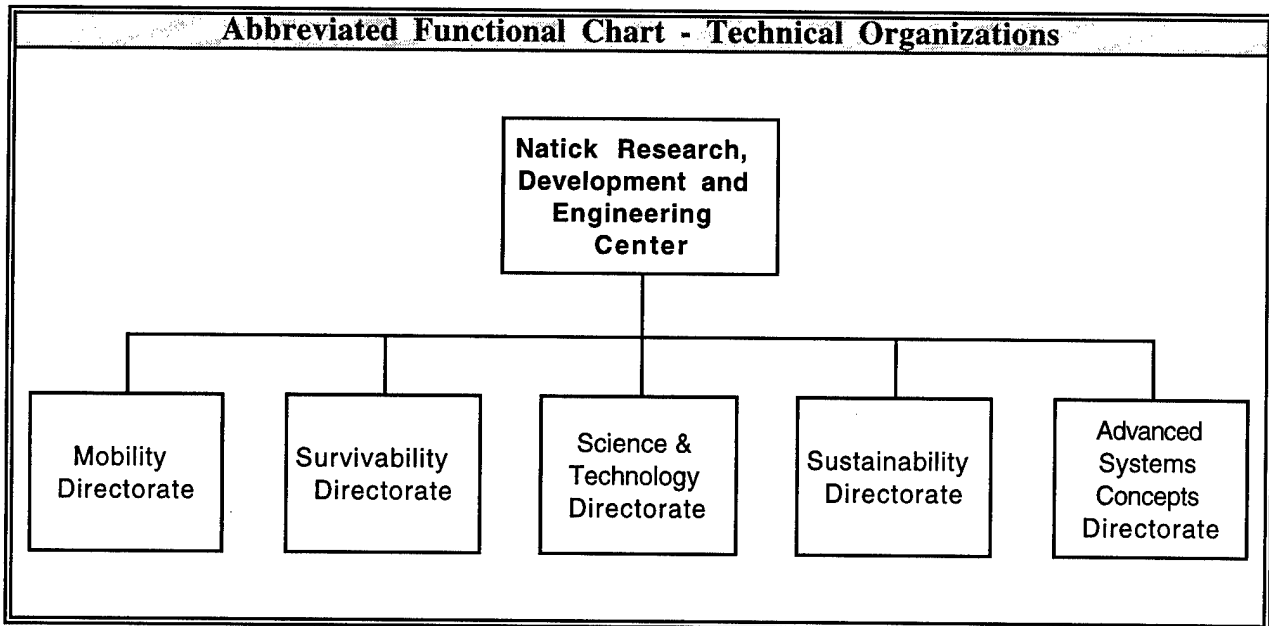
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	8	0	8
CIVILIAN	56	1,262	553	1,871
TOTAL	56	1,270	553	1,879

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	944.069	REAL PROPERTY	220.152
ADMIN	237.330	* NEW CAPITAL EQUIPMENT	0.154
OTHER	143.587	EQUIPMENT	338.843
TOTAL	1,324.986	* NEW SCIENTIFIC & ENG. EQUIP.	14.824
ACRES	4,000	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Natick Research, Development & Engineering Center



Natick Research, Development & Engineering Center

Natick, MA 01760-5000
(508) 233-4300

Acting Director: Mr. Philip Brandler
Deputy Director: LTC David F. Faulkner

MISSION

To provide superior products and technologies that protect, sustain, and improve the quality of life for our foremost customers -- the men and women of our armed forces -- under extreme environmental and hazardous conditions worldwide.

NRDEC accomplishes its mission by conducting research, development, testing, evaluation, and engineering of the systems and materiel that support today's warfighters and peacekeepers and will equip them for the future. NRDEC is also the executive agent for the Department of Defense's food and nutrition research, development, testing, and engineering program; and a DoD Center of Excellence for Clothing & Textiles.

CURRENT IMPORTANT PROGRAMS

1. Maximize the combatant's survivability through development of integrated, modular, components that provide individual protection from ballistic, percutaneous chemical and biological, environmental, flame, surveillance, and directed energy threats.

One Cooperative Research and Development Agreement (CRADA) supports ballistic protection R&D fibers for ballistic impact applications. Another CRADA supports detection and identification of counterfeit materials through development of spectrally responsive fibers.

2. Development of technology insertions for a 21st Century integrated, modular individual fighting system that links the soldier to the digitized command and control network.

3. Provide soldiers with enhanced Quality of Life in the field through the development and fielding of advanced field services equipment. Improvements in field services focus on showers, laundries, and latrine facilities as well as the integration of heating and cooling into field rest and recuperation facilities, ensuring complete operation in all environmental extremes.

4. Develop a family of high performance-enhancing combat rations (special purpose and standard Individual/Group) and modularized, rapidly deployable field feeding equipment systems for all the services to support the full spectrum of tactical scenarios.

Several CRADAS support combat rations and field feeding R&D innovative methods to process meals in microwave retort pouches, irradiation processes in the preservation of foods; improved capability for preparing special microencapsulated performance-enhancing nutrients; encapsulation systems utilizing lipid vesicle technology; chocolate-based individual ration components; novel edible food; shelf stable, eat-out-of-hand ration components; candidate replacements for the Flameless Ration Heater; antifungal/antibacterial agent to extend the shelf life of military rations; and researching the production of biodegradable plastic from milkfat.

CURRENT IMPORTANT PROGRAMS (continued)

5. Enhance the mobility of the combatant with the following systems: terrain traversal, personnel augmentation equipment, personnel and cargo airdrop. One CRADA supports airdrop R&D cushioning airdrop payloads by using gas-injected airbag technology.

6. Protect personnel and combat equipment systems through the development and fielding for our foremost customers -- the men and women of our armed forces -- under extreme environmental and hazardous conditions worldwide.

NRDEC accomplishes its mission by conducting research, development, testing, evaluation, and engineering of the systems and materiel.

EQUIPMENT/FACILITIES

Unique facilities at Natick include: man-rated climatic chambers capable of simulating world-wide environmental conditions; the Defense Simulation Internet (DSI) Facility which connects to the worldwide DSI for inserting fully outfitted dismounted infantrymen into the world of distributed interactive simulation; the aircraft and airdrop load roller conveyor, static, and drop test facilities; the soft shelters prototype fabrication facility which has many unique state of the art tentage fabrication machines and tools, including radio frequency fabric welders, hot wedge and hot air seam sealers, and is collocated with the rain test tower; food packaging facilities capable of prototype plant scale operations and simulation of rough handling; food processing pilot plant facilities; the food service equipment, engineering and evaluation lab including hooded work areas for chemical and combustion testing, a machine shop, an energy utilization panel, portable diagnostic and gas measurement instruments, and sound levels equipment; a complete laser laboratory with an alexandrite (variable frequency) laser; a fiber spinning and recycling facility; a dyeing, printing, and finishing fabrics pilot plant; a seams lab; a microbiology lab with a molecular modeling graphics workstation; a biotechnology lab with automated respirator; fermentation facility; a microscopy lab with optical, electron, and atomic force microscopes; a taste test lab; and a terrain analysis system.

Other equipment at Natick includes spectrophotometers, a CCD camera imaging system, robotic chemical agent stimulant materials test apparatus, oligonucleotide & peptide synthesizers, peptide sequencers, thermal analysis equipment, chambers for simulating artificial light, multi-layer film extrusion system, ballistics high speed impact test equipment, a materials testing machine (100 lb capacity), a computer video-analysis system, three-dimensional head and full body scanners, instrumented manikins, a small flight test/ultralight aircraft, a computerized pattern generating and grading system, a computerized rapid prototype machine, a twin screw extruder, and chromatographs with capabilities including GC, GC/MS, GDC, and HPLC.

BIOMECHANICS LABORATORY. This unique lab was established jointly by Natick and the U.S. Army Research Institute of Environmental Medicine (USARIEM). This Center for Military Biomechanical Research, the only facility of its kind within DOD, is designed for the study of ergonomic aspects of clothing and individual equipment, occupational medicine, and physical performance.

FUEL CELL. Selected as one of the DoD national test program sites for fuel cell technology, Natick became home to New England's first electricity-generating, nonpolluting fuel cell. The hot water is used by the steam distribution systems for heating and cooling. Use of the fuel cell technology will improve air quality and reduce costs by \$70,000 per year.

Natick Research, Development & Engineering CenterNatick, MA 01760-5000
(508) 233-4300Acting Director: Mr. Philip Brandler
Deputy Director: LTC David F. Faulkner

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.355	N/A	0.355
6.1 Other	1.680	0.443	2.123
6.2	12.789	14.614	27.403
6.3	4.407	13.670	18.077
Subtotal (S&T)	19.231	28.727	47.958
6.4	5.594	3.937	9.531
6.5	9.379	5.195	14.574
6.6	0.464	2.030	2.494
6.7	0.217	0.068	0.285
Non-DOD	1.040	6.132	7.172
TOTAL RDT&E	35.925	46.089	82.014
Procurement	0.000	0.000	0.000
Operations & Maintenance	10.302	2.032	12.334
Other	0.000	0.000	0.000
TOTAL FUNDING	46.227	48.121	94.348

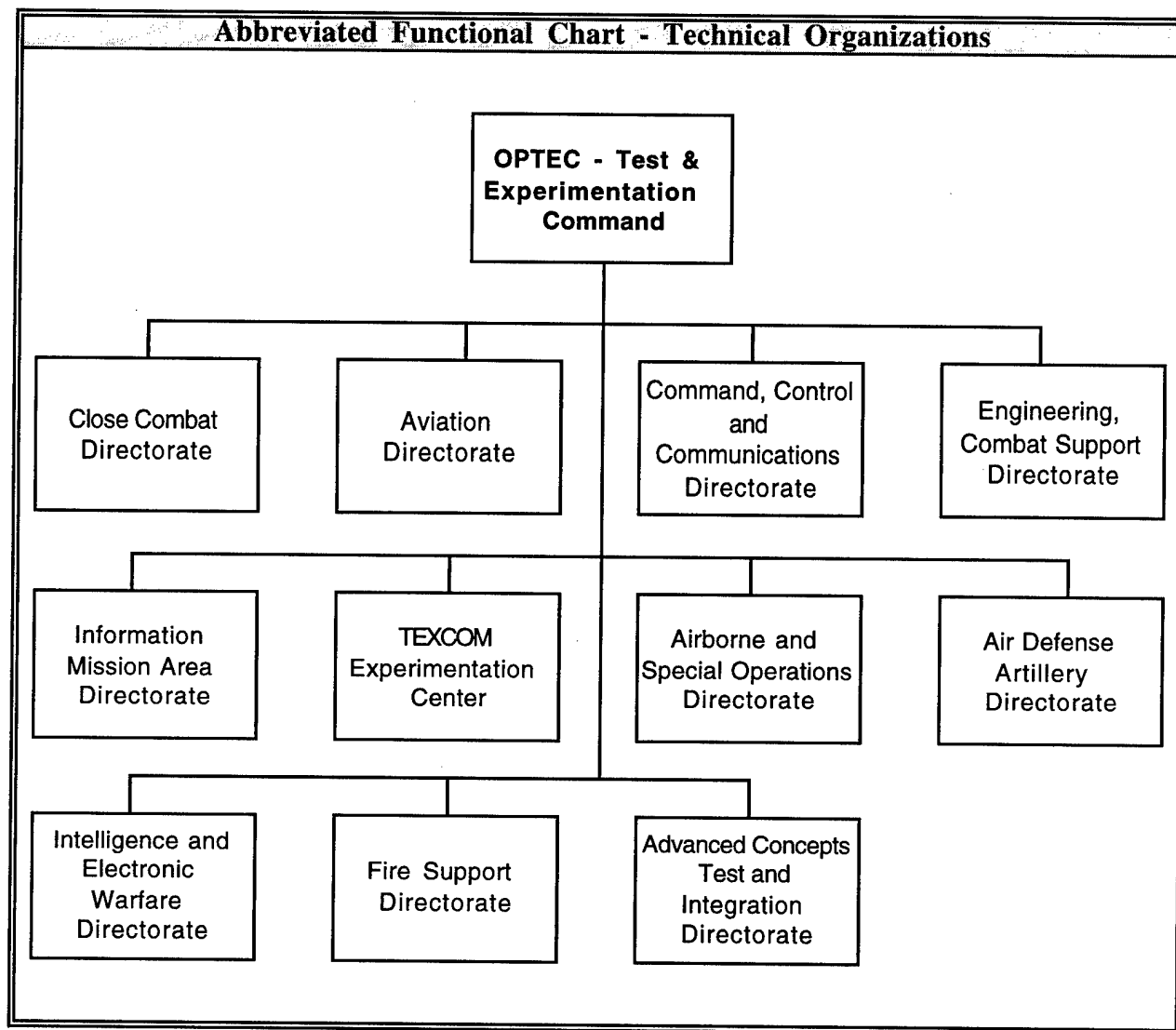
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	4	9	13
CIVILIAN	51	296	149	496
TOTAL	51	300	158	509

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	174.846	REAL PROPERTY	18.600
ADMIN	184.465	* NEW CAPITAL EQUIPMENT	0.000
OTHER	55.097	EQUIPMENT	2.200
TOTAL	414.408	* NEW SCIENTIFIC & ENG. EQUIP.	0.150
ACRES	58	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

OPTEC-Test and Experimentation Command



OPTEC-Test and Experimentation Command
Fort Hood, TX 76544-5065
(817) 288-9114

Commander: BG A. J. Madora
Technical Director: Brian Barr

MISSION

Support the Army materiel acquisition and force development processes by executing the User Testing Program and conducting operational testing to support force development.

CURRENT IMPORTANT PROGRAMS

ACPM	Aircrew Protective Mask
BIDS	Biological Integrated Detection System
CCTT	Close Combat Tactical Trainer
C2V	Command and Control Vehicle
C17	New Cargo Aircraft
DVE	Driver's Vision Enhancer
EMUT	Enhanced Manpack Ultra-high Frequency Terminal
EPLRS	Enhanced Position Location Reporting System
IRV	Improved Recovery Vehicle
JCALs	Joint Computer-Aided Acquisition and Logistics System
JSLIST	Joint Service Lightweight Integrated Suit Technology
SSP	Strategic Sealift Program
TF XXI	Task Force XXI

EQUIPMENT/FACILITIES

Position location, high angle modular integrated target, video, data acquisition and reduction, thermal imaging, fiber optics and video multiplexer/ demultiplexer, range timing, microwave, environmental measurement and survey.

OPTEC-Test and Experimentation Command

Fort Hood, TX 76544-5065

(817) 288-9114

Commander: BG A. J. Madora

Technical Director: Brian Barr

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	59.500	0.000	59.500
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	59.500	0.000	59.500
Procurement	0.000	0.000	0.000
Operations & Maintenance	57.300	0.000	57.300
Other	0.000	0.000	0.000
TOTAL FUNDING	116.800	0.000	116.800

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

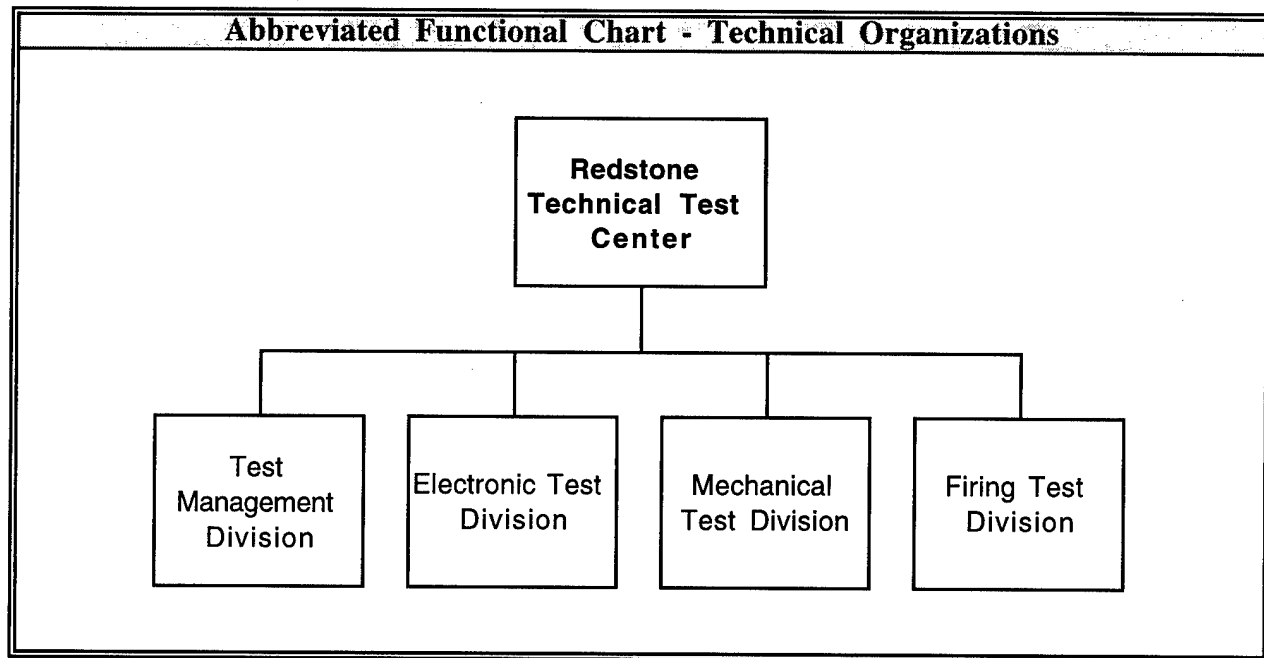
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	23	564	587
CIVILIAN	2	61	386	449
TOTAL	2	84	950	1,036

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	19.900	REAL PROPERTY	6.300
ADMIN	41.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	0.000	EQUIPMENT	3.000
TOTAL	60.900	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	22	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Redstone Technical Test Center



Redstone Technical Test Center
Redstone Arsenal, AL 35898-8052
(205) 876-4482

Director: Larry H. Johnson
Deputy Director: Carl E. Roberts

MISSION

Plan, conduct, analyze, and report the results of technical tests of subsystems and components of major weapon systems and associated systems/materials; conduct life cycle technical testing of small rockets/guided missiles, and serve as DOD Lightning Test Facility for hazardous items. RTTC provides testing and test support for rocket and missile research, development, test, and evaluation and other missions of authorized customers within the Department of Defense and outside the DOD, to include government and non-government organizations, domestic and foreign.

CURRENT IMPORTANT PROGRAMS

Air-To-Ground Missile System (HELLFIRE)
Air-To-Ground Missile System (LONGBOW)
TOW Missile System
Improved Target Acquisition System (ITAS)
Improved Bradley Acquisition Subsystem (IBAS)
Javelin Missile System
Multiple Launch Rocket System (MLRS)
ATACMS/BAT
MPIM SRAW
MICOM Missile Repair Parts Program
MICOM Missile Shelf Life/Surveillance Program
Enhanced Fiber Optic Guided Missile (EFOG-M)
M72
Bunker Defeat Munition (BDM)

EQUIPMENT/FACILITIES

Extensive equipment/instrumentation for performing complete functional tests in the laboratory and field, of weapon system subsystems and components including IR, millimeter wave, and laser seekers and guidance sections, IR and visual target acquisition systems, antennas, fire control systems, gyroscopes, batteries, electronic and mechanical safe and arm devices, passive components, circuit cards, integrated circuits and other electronic, mechanical, optical, and RF devices. Testing can be accomplished at environmental extremes and test methodology is rapidly expanding to incorporate hardware-in-the-loop (HIL) and state-of-art modeling and simulation (M&S) techniques to project subsystem/component test data to system level performance. Specialized and automated test instrumentation is available/can be developed for particular weapon system application in either a laboratory or remote site environment. Flight test ranges up to 8KM are fully equipped with video and film fixed and tracking cameras, Doppler radars, GPS, telemetry and hard-line instrumentation, and tactical and simulated air and ground targets. A simulation/Test Acceptance facility provides a unique, non-destructive HIL test capability for acceptance testing of all-up-round (AUR) MMW-guided missiles. A 2000 acre, 5KM, laser/optical range for designator/sensor testing has an elevated mound, a 75 ft tower with enclosed 2-story cab, and equipment/instrumentation/aircraft for captive carry and dirty battlefield scenarios. State-of-art instrumentation is available to accurately determine aircraft/target/sensor positions, provide atmospheric transmission measurements, determine target-to-background contract measurements, and provide target thermal signatures. Development of high resolution, three dimensional, interactive, validated terrain models of RTTC ranges in the visual, infrared, and MMW bandwidths is in progress. Facilities for static and dynamic warhead testing are fully equipped with high speed cameras and flash radiography. Full range of equipment/chambers is available for nondestructive and climatic testing. Static test facilities can accommodate static and liquid rocket motors up to 150K pounds vertical thrust and 10M pounds horizontal thrust. Rocket motor dissection capability exists and a thermal ablative/ducted rocket engine test facility is nearing completion. Dynamic test capabilities include vibration, shock, drop, centrifuge, and rail impact testing. E3 facilities conduct EMRH/EMRO, EMI, antenna and RCS measurements. A radar Environment Emulation System housed in a broadband, 100 DB shielded, anechoic chamber provides capability to test weapon systems to high power, pulse modulated EMR environments.

Redstone Technical Test Center
 Redstone Arsenal, AL 35898-8052
 (205) 876-4482

Director: Larry H. Johnson
 Deputy Director: Carl E. Roberts

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	24.978	0.000	24.978
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	24.978	0.000	24.978
Procurement	16.290	0.000	16.290
Operations & Maintenance	3.801	0.000	3.801
Other	9.231	0.000	9.231
TOTAL FUNDING	54.300	0.000	54.300

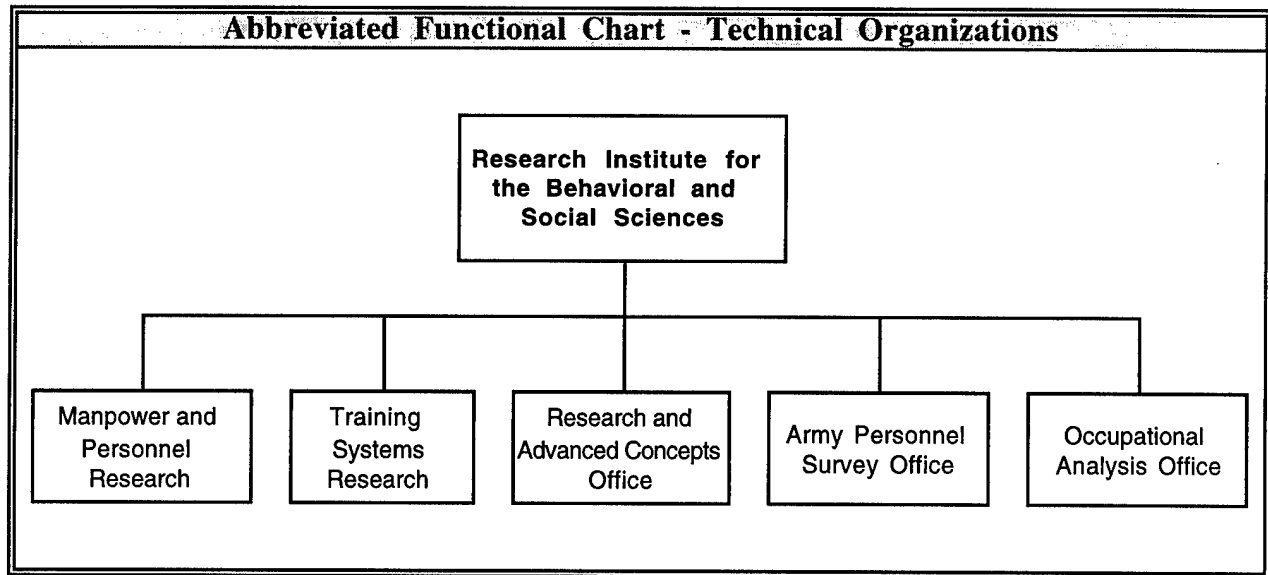
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	0	0	0
CIVILIAN	1	90	69	160
TOTAL	1	90	69	160

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	460.000	REAL PROPERTY	146.000
ADMIN	52.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	133.000	EQUIPMENT	0.000
TOTAL	645.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	14,000	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Research Institute for the Behavioral & Social Sciences



Research Institute for the Behavioral & Social Sciences

Alexandria, VA 22333-5600
(703) 617-8636

Director: Dr. Edgar M. Johnson
Chief of Staff: COL Neil W. Grotegut

MISSION

Maximize individual and unit performance through advances in human resources development in conjunction with effective and affordable training strategies to meet the full range of Army missions. ARI achieves its mission through activities of its research units located at its headquarters in Alexandria, VA and elsewhere CONUS and OCONUS (see the following list). In all cases ARI is a tenant at these locations where the host activity provides services (e.g., facilities, utilities) for a fee. Research Units: Simulator Systems Research Unit (Orlando, FL); Armored Forces Research Unit (Ft. Knox); Infantry Forces Research Unit (Ft. Benning, GA); Reserve Component Training Research Unit (Boise, ID); Rotary-Wing Aviation Research Unit (Ft. Rucker, AL); Ft. Leavenworth Research Unit (Ft. Leavenworth, KS); Leader Development Research Unit (West Point, NY). Scientific Coordination Offices: Ft. Bragg (Ft. Bragg, NC); Ft. Hood SCO (Ft. Hood, TX); USAREUR SCO (Heidelberg, GE); London SCO (London, England) and TRADOC SCO (Ft. Monroe, VA).

CURRENT IMPORTANT PROGRAMS

1. Battle command leader development.
2. Recruitment, selection, assessment and retention.
3. Unit training techniques and strategies.
4. Rotary wing training.
5. Land warfare training.

EQUIPMENT/FACILITIES

In-house experimental facilities include laboratory and computer facilities for real-time, man-in-the-loop experimentation. Unique assets include: combat arms simulators; Virtual Reality test bed; a modular, reconfigurable flight simulator for helicopter pilot research; simulators for UH-1Fs, AH-74A & UH-60A helicopters; research access to SIMNET; and Battle Command Experimentation Center.

Research Institute for the Behavioral & Social Sciences

Alexandria, VA 22333-5600

(703) 617-8636

Director: Dr. Edgar M. Johnson

Chief of Staff: COL Neil W. Grotegut

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.122	N/A	0.122
6.1 Other	0.485	2.150	2.635
6.2	6.005	1.525	7.530
6.3	4.061	0.691	4.752
Subtotal (S&T)	10.673	4.366	15.039
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	6.660	2.122	8.782
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	17.333	6.488	23.821
Procurement	0.000	0.000	0.000
Operations & Maintenance	2.072	2.218	4.290
Other	0.000	0.000	0.000
TOTAL FUNDING	19.405	8.706	28.111

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

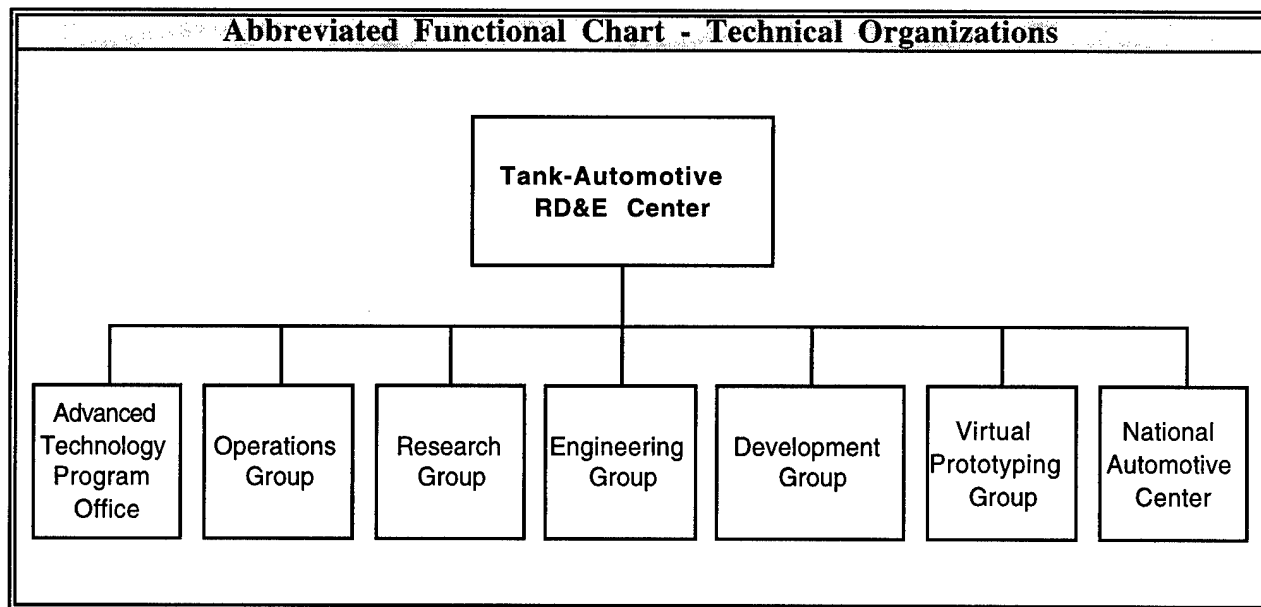
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	7	4	11
CIVILIAN	91	18	80	189
TOTAL	91	25	84	200

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	20.700	REAL PROPERTY	15.000
ADMIN	66.200	* NEW CAPITAL EQUIPMENT	0.000
OTHER	11.400	EQUIPMENT	17.000
TOTAL	98.300	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Tank-Automotive Research, Development & Engineering Center



Tank-Automotive Research, Development & Engineering Center

Warren, MI 48397-5000
(810) 574-5663

Commander: MG Edward L. Andrews
Director: Jerry L. Chapin

MISSION

Conduct research, development and engineering and leverage advanced automotive technology to provide our soldiers with the world's technologically superior ground vehicle systems and logistics support equipment. Serve as the Army's focal point for the development of dual-use automotive technologies and their application to military ground vehicles. Provide life-cycle management, engineering and technical support necessary to guarantee continuous systems readiness.

CURRENT IMPORTANT PROGRAMS

1. ADVANCED TECHNOLOGY DEMONSTRATIONS (ATDs) focus TARDEC's Science and Technology (S&T) programs on current and future customer requirements while showcasing technological opportunities for advanced ground vehicle warfighting capabilities.

-The Crewman's Associate ATD completed trials and experiments this year. It demonstrated the potential of advanced crewstation design and techniques for current system upgrades and future vehicle systems.

-The Hit Avoidance ATD currently in the design/fabrication phase, will demonstrate an integrated set of sensors, countermeasures and decoys which will greatly decrease the reliance on heavy armors for future systems while dramatically increasing the survivability of current systems.

-The Composite Armored Vehicle (CAV) ATD completed design with fabrication completion and roll-out planned for mid-2QFY97. CAV has achieved it's weight savings of over 33% when compared to current systems. Performance and warfighter experimentation in FY97 will confirm CAV-like lightweight material designs for future vehicle systems.

-The Future Scout & Cavalry System FSCS ATD concept development, technology tradeoff assessments and program formulation began this year. Design and fabrication will begin in FY98. This ATD will be cooperatively executed with the United Kingdom. Specific international roles and responsibilities are being established.

2. TECHNOLOGY DEMONSTRATIONS comprise a majority of TARDEC non-ATD S&T programs and are formulated by Army agencies as a Science and Technology Objective (STO). Individually approved by the warfighting customer, each STO delivers a measurable new warfighting capability or a cost saving method to streamline ground vehicle acquisition and support investments. Current STOs under development include advanced mobility systems for light and heavy class combat vehicles, advanced electronic architectures primarily implemented through commercial standards, multi-purpose fluid & lubricants, emerging petroleum quality technologies, improved life & flow water purification technologies, new armor protection and design methodologies, laser protection for unity vision devices, and detection avoidance/signature management technology.

3. TECHNOLOGY DEVELOPMENT - The ground vehicle subarea of the 1996 DoD Ground Vehicle and Watercraft Defense Technology Area Plan (DTAP) identifies five unique technology efforts critical to fielding technologically superior warfighting systems. The technology efforts are: Systems Integration, Integrated Survivability, Intra-vehicular Electronics, Advanced Mobility, and Chassis & Turret Structures. To consolidate and integrate DoD-Wide and Industry ground vehicle technology investment, a systems engineering approach to Science & Technology planning was initiated entitled Technology Development Approach (TDA). The TDA identifies unique technology opportunities, establishes quantified technology goals with resultant ground vehicle system payoffs. The product of the TDA is a set of technology programs eg. ATDs & STOs per above, which are focused and maintain a consistent direction over multiple year budgets.

CURRENT IMPORTANT PROGRAMS (continued)

4. VEHICLE PERFORMANCE SIMULATION/VIRTUAL PROTOTYPING efforts are centered on M1A2 improvements, FSCS system and technology tradeoff assessments, logistic improvement systems and manufacturing facilities for ground systems. Integrated Product and Process Development (IPPD) is applied to all ground vehicle systems and technology developments. The CAV ATD through the implementation of IPPD has been a leader in establishing Army affordability methodology.

5. EMERGING SYSTEMS are based on recommendations of warfighter lead Integrated Concept Teams (ICTs) sponsored by the US Army Training & Doctrine Command TRADOC). ICTs this year focusing on future systems include: Future Combat System (FCS), Future Scout & Cavalry System (FSCS), and Future Infantry Vehicle (FIV). An ICT also proposed upgrades to the M1 Abrams Main Battle Tank. In addition to ICT recommendations, a Petroleum Quality Analysis system is an emerging logistic system initiated with strong backing from the Combat Service Support warfighter organizations.

- Provided concept and manufacturing drawings, and built prototype combat identification panels for tracked vehicles, and for the HMMWV; designed, produced and fielded combat identification panels to U.S. Army Europe Units.

- Provided mine resistant components and panels to the soldiers in Bosnia and other locations. These vehicles were provided to allow greater survivability in areas with high concentrations of land mines as experienced in Bosnia and other overseas locations.

6. Support to PEO's ie. M1A2 SEP, Bradley M2A3, Digitization of the Battlefield, Heavy Dry Support Bridge, Tactical Vehicle Mine Protection.

Other Support to PEOs:

- Provided electronics architecture and/or embedded mapping consultation to PM Abrams, Bradley and CMS.

- Developed and provided digital map editing station to provide usable, integratable DMA based maps for embedded vehicle use by PM Abrams and Bradley during M1A2 SEP and M2A3 test and evaluation.

- Trucks and other wheeled vehicles for the Army. Emerging Systems is currently providing modeling and simulations and three dimensional drawings for future variants of the Palletized Loader System(PLS) vehicles. Currently under development are concepts for a 5000 gallon tanker truck based on the PLS chassis.

- A PLS based DEMOIII truck full scale hardware development and integration effort has been completed including up horsepower, new transmission, independent suspension, disc brakes and concepts for weight reduction.

7. Weapon System Management and Configuration Control for 19 systems in development, 34 systems in production/deployment and 2801 systems in sustainment (vehicles and end items). This encompasses over 850,000 military ground vehicles, 300,000 unique spare parts equating to 2.5 billion components (average of 3,000 parts per vehicle). Configuration control is maintained via 934,000 drawings. System support includes: materiel & combat development integration, acquisition, concurrent engineering, mfg & producibility engineering, product assurance, engineering data management, validation of technical data, field technical assistance, specifications and standards, tech adaptation/development/integration/transition and test management.

8. Technology Transfer Efforts:

- Participation in a joint military/commercial light truck demonstrator program, using advanced commercial technologies.

- Continued development, demonstration and deployment of the Automotive Product Development Framework (APDF), a comprehensive, integrated virtual prototyping system for ground vehicles with

CURRENT IMPORTANT PROGRAMS (continued)

advanced capabilities to automatically integrate and operate existing, dissimilar software products in a unified operating environment.

- Organizing a Land Navigation Conference in April 97 to assist successful mass-market utilization of the Global Positioning System by the automobile, transportation and land navigation communities.

- Organizing an automotive Night Driving Conference in June 97 to enhance ground vehicle industry access to military night vision technology, improve civilian night driving safety and promote lower prices for military night vision technology.

- Demonstration of new environmentally compliant and pollution prevention initiatives for petroleum and related products by introducing recycling capabilities for DOD and new non hazardous/non toxic petroleum product substitutes.

- Demonstrate military ground vehicle and missile applications of selectively reinforced, silicon carbide whisker - aluminum metal matrix composite (AL-MMC) materials.

- Continue joint military/civilian vehicle safety research with GM, through applications and expansions of the TARDEC Visual Perception Model, which quantifies human visual perception processes.

- Continue joint TARDEC/industry projects to prolong lead-acid battery life, and to reduce their use, through ultracapacitor starting aids, smart electronic battery management, and modeling tools which improve vehicle electrical system behavior.

EQUIPMENT/FACILITIES

TARDEC is the only Army/DoD Tank-Automotive Research, Development and Engineering Center committed to overall ground vehicle technology and integration.

NATIONAL AUTOMOTIVE CENTER, a joint venture with the American automotive industry and TARDEC, is leading the way in 'dual use' of critical technologies.

PROPULSION LABORATORY: has six R&D computer controlled engine and transmission test cells, three vehicle test cells and an airflow lab featuring a chassis dynamometer facility, a truck driveline test cell, a unique environmentally controlled large tracked vehicle dynamometer test chamber with wind, ambient temperature, and solar radiation simulation capability, brake, heat exchanger, air cleaner, and battery testing facilities.

TIRE LABORATORY: provides full range of tire and roadwheel performance, endurance, and shock testing capability.

TRACK and SUSPENSION LABORATORY is used to conduct testing and evaluation of current and prototype combat vehicle components. Specific test systems include a track pad test machine, 1/4 HMMWV suspension test platform, three degree of freedom track loading, torsion bar test and linear shock absorber test. Generic capabilities are available for high static loading and endurance/ fatigue test scenarios. Available linear and rotary hydraulic components and instrumentation allow for flexible test design and configuration.

ARMOR INTEGRATION LAB performs armor system fabrication and ballistic testing.

VISUAL PERCEPTION LABORATORY augments available field test data by providing a controlled environment to measure the detectability of signature management systems using trained military observers.

LASER PROTECTION LABORATORY used to develop and evaluate materials and techniques to harden combat vehicle surveillance vision optics against multiple laser hazards and threats.

EQUIPMENT/FACILITIES (continued)

ENVIRONMENTAL TEST CELL performs high temperature performance tests on vehicles.

VEHICLE ELECTRONICS (VETRONICS) LABORATORIES include:

- Combat Vehicle Systems Integration Lab composed of ADA based vehicle ready electronics, computer systems, and crew stations for proof of principle demonstrations of advanced and open electronic architecture approaches;
- Crew Station Simulator Lab composed of the following DIS compatible man-in-the-loop virtual simulators and support environments: 2/3 Man Tank, M2A3 HMMWV, MODSAF, ITEMS and virtual world/terrain modeling;
- Drivers Automation Lab composed of several tactical wheeled and combat vehicle systems with a variety of autonomous and semi-autonomous driving aids and sensors (i.e. collision avoidance system) and a base station for tele-operated field demonstrations.

COMBAT VEHICLE COMMAND AND CONTROL FACILITY provides an automated command and control system for armor/infantry vehicles, a tactical situation display in all vehicles, and supports the Army Horizontal Technology Insertion Program.

TACOM Ground Vehicle Systems Simulation Laboratory houses national resources for full scale vehicle simulation. A one of a kind state-of-the-art turret motion base simulator is the center piece of this laboratory. The hexapod configuration has six degrees of freedom capable of providing full scale dynamic motion and loads for manned operational turrets of up to 25 tons.

This laboratory also houses the chassis/hull dynamic load simulator capable of providing dynamic load inputs to ground mobility systems (tanks/trucks, hulls, frames, etc.) of weights up to 55 tons. A third unique simulator is the state of the art trailer/pintle dynamic load simulator capable of providing full load dynamic terrain inputs and coupled pintle dynamic loads for the full range of trailers. In addition a six degree of freedom high bandwidth full scale crew/driver station simulator is housed in this facility and is capable of real time man the loop simulations.

The TACOM High performance Center (HPC) which operates a 64 processor Power Challenge Array (PCA) Parallel Processor Super computer is Collocated in this facility and is one of only eleven DOD national shared resource high performance computer centers. In addition, this center provides computational capability for real time inputs needed by the Ground Vehicle System Simulation Laboratory.

TARDEC VIRTUAL PROTOTYPING LABORATORY is capable of displaying inter-active computer aided design solid model virtual mock-up of present and future ground vehicle systems. A wide range of state of the art 3-D stereo display devices (helmet, boom, projection, and holographic) are used for interactive virtual mock-up of vehicle systems and manufacturing facilities. In addition state of the art CAD work stations directly networked to the HPC PCA will allow real time interactive immersive environments for virtual mock-up of vehicle systems.

BRIDGE TEST FACILITY used in testing static or dynamic cyclic loads on various bridge designs.

WATER QUALITY AND WATER TEST CELL LABORATORIES - used for the testing of various water filter elements, water filter systems, and provides chemical analytical support to water purification engineer functions.

FUEL EQUIPMENT TEST LABORATORY used for testing and evaluating fuel pumps, fuel filter elements, fuel filter separators, fuel nozzles and engine fuel filter elements.

GREASE AND FLUID LABORATORY performs development, evaluation, and environmental compliance assessments of hydraulic fluids, semi-solid lubricants, solid lubricants, antifreeze, and solvents to enable introduction of new technologies and development of new performance standards.

EQUIPMENT/FACILITIES (continued)

FUELS AND POWERTRAIN LUBRICANTS LABORATORY performs development, evaluation, and environmental compliance assessments of fuels, alternative fuels, and powertrain lubricants (i.e., engine oils, gear lubricants, and transmission fluids) to enable introduction of new technologies and development of new performance standards.

TARDEC FUELS AND LUBRICANTS RESEARCH FACILITY (SWRI) a Government owned, contractor operated facility at the The Southwest Research Institute, is a one-of-a-kind resource where integrated fuels-lubricants-engine systems research and development programs can be performed involving combustion, performance characterization, engine cleanliness, vulnerability assessments, and tribology can be performed.

OTHER facilities and equipment include: software engineering, signature, dynamic motion simulator (seat simulator), fabrication, computer-aided design, Laminate Object Manufacturing (LOM) rapid prototyping system, packaging engineering, model shop, metallurgical, mechanical test, animation capabilities used in support of virtual prototyping, rapid prototyping, visualization capabilities, sheet/metal welding, machine shop, assembly shop, electrical, battery test, instrumentation, IR imaging, thermal wave microscopy, applied engineering, scanning electronic microscope, and material spectrum analyzer.

Tank-Automotive Research, Development & Engineering CenterWarren, MI 48397-5000
(810) 574-5663

Commander: MG Edward L. Andrews

Director: Jerry L. Chapin

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.855	N/A	0.855
6.1 Other	0.907	3.882	4.789
6.2	26.117	40.695	66.812
6.3	7.613	18.955	26.568
Subtotal (S&T)	35.492	63.532	99.024
6.4	2.222	16.229	18.451
6.5	0.073	2.336	2.409
6.6	3.299	5.367	8.666
6.7	0.183	0.358	0.541
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	41.269	87.822	129.091
Procurement	0.000	0.000	0.000
Operations & Maintenance	36.269	15.480	51.749
Other	10.337	8.092	18.429
TOTAL FUNDING	87.875	111.394	199.269

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

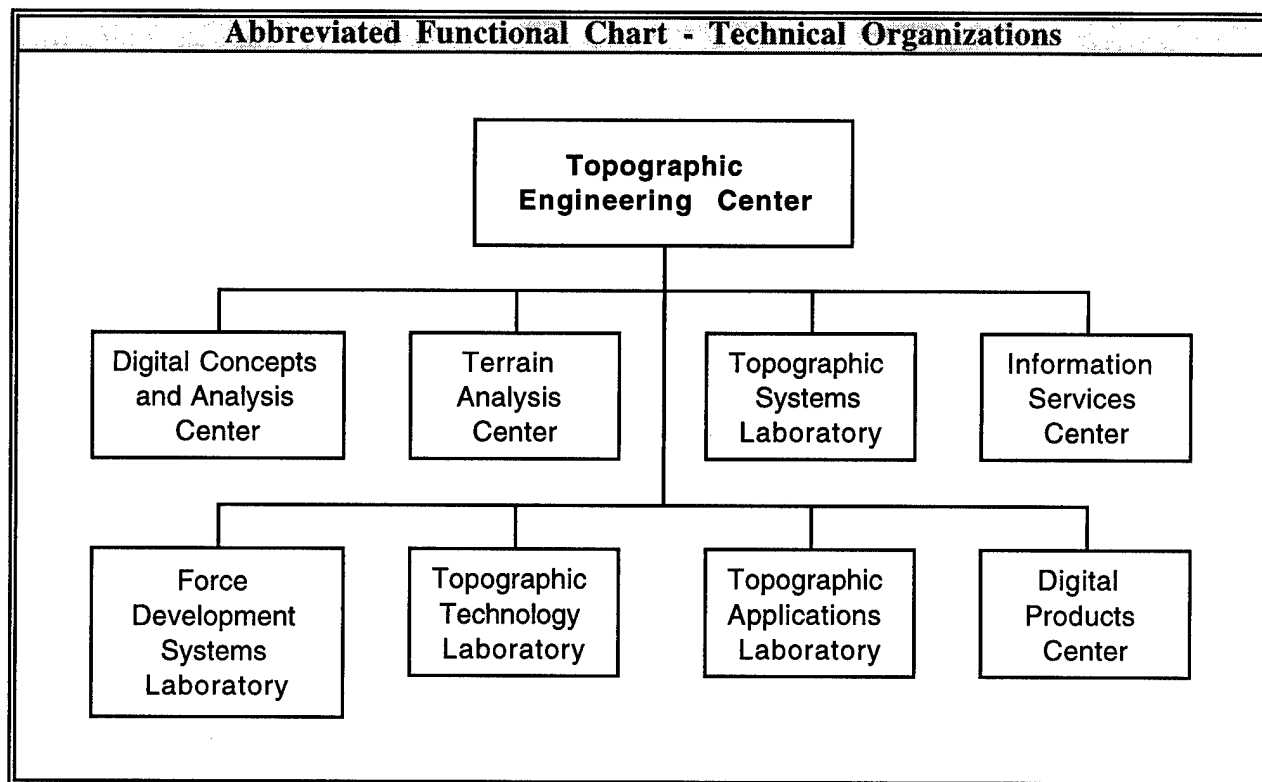
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	13	0	13
CIVILIAN	24	646	528	1,198
TOTAL	24	659	528	1,211

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	457.050	REAL PROPERTY	115.500
ADMIN	123.959	* NEW CAPITAL EQUIPMENT	0.603
OTHER	57.564	EQUIPMENT	222.211
TOTAL	638.573	* NEW SCIENTIFIC & ENG. EQUIP.	2.361
ACRES	105	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Topographic Engineering Center



Topographic Engineering Center
Alexandria, VA 22315-3864
(703) 428-6654

Acting Director: COL Robert F. Kirby
Commander: COL Robert F. Kirby

MISSION

The U.S. Army Topographic Engineering Center (TEC) is a field operating activity under the command of the U.S. Army Corps of Engineers (USACE). TEC's mission is to provide America's soldiers and their commanders with superior knowledge of the battlefield and to support the nation's civil and environmental initiatives through research, development and the application of expertise in topographic and related sciences. The mission involves research and development (R&D), system acquisition, operations and maintenance (OMA), and civil works programs. Military and civil R&D programs are guided by the USACE Director of Research and Development. System development programs are directed by the Program Executive Officer Command Control Communications Systems (PEO C3S), Program Executive Officer Intelligence and Electronic Warfare (PEO IEW), Deputy Chief of Staff, Operations (DCSOPS), and other agencies. Operations and Maintenance, Army (OMA) programs are under the guidance of the Deputy Chief of Staff for Intelligence (DCSINT) and the Office of the Chief of Engineers - Pentagon. The Engineer Strategic Studies Center (ESSC), under the operational control of the Deputy Chief of Engineers, serves as the Chief of Engineers' center of creative, innovative, analytical thought.

Vision: The preferred provider of quality geospatial research, development, products, and services.

CURRENT IMPORTANT PROGRAMS

Military and civil R&D efforts make extensive use of remote sensing technologies and geospatial data generation and portrayal. Research and development areas include: rapid generation of geospatial data; terrain analysis and characterization; passive and active spectral signature identification; photogrammetry; terrain visualization; battlefield and terrain-related simulation and modeling; precision surveying and mapping; image analysis; data management; geographic information systems; and data/image fusion. As USACE's Center of Expertise in surveying and mapping, TEC provides support to Corps of Engineer headquarters, divisions, and districts, as well as other civil agencies, to ensure consistency of surveying and mapping products, to maintain the capability to manage complex, nation-wide survey systems, and to allow for the expert data analysis. TEC also has skills in systems engineering, acquisition management, sustainment, and support. TEC provides developmental and demonstration support to PM, Joint Precision Strike, developmental support to the Army Space Programs Office and PEOC3S for the Combat Terrain Information System.

Operationally, TEC serves as the Army's primary agent for terrain analysis and the Department of Defense's (DoD) primary agent for water detection. Support for contingency plans, military operations, and operations other than war is provided to terrain teams, DoD, DA Staff, MACOMs, and joint commands. TEC serves as the Army's technical expert to combat and material developers and other users of geospatial information. TEC provides technical leadership for the orderly, cost-effective integration of digital terrain data into Army systems and activities, and advises the Department of the Army Headquarters on all technical aspects of geospatial information requirements and standards.

EQUIPMENT/FACILITIES

TEC facilities include: the Space Research Test Bed (SRTB); the Synthetic Environments Evaluation and Demonstration Site (SEEDS); the Virtual Laboratory; the Integration and Evaluation Center (IEC); the Spectral Research Facility; the Global Positioning System (GPS) and Survey Engineering Laboratory; the Battlefield Visualization Test Bed; the Terrain Information Extraction System (TIES); and the Collection Management Office (CMO). SRTB provides an imagery exploitation test bed to support TEC reimbursable, technology base R&D operational programs. The SEEDS facility provides hardware and software for the integration, test, evaluation, and demonstration of cutting-edge modeling and simulation geospatial technologies. The Virtual Laboratory links the national and tactical imagery intelligence and topographic communities to the CINCs and operational Army elements. The IEC provides access to forces worldwide through the use of Army Global Grid connectivity, dedicated T-1 and T-3 lines to key installations, Asynchronous Transfer Mode (ATM) access, and Deployable Very Small Aperture Terminal (VSAT) supporting wideband satellite communications for conducting large-scale warfighting experiments. The spectral research facility contains a spectral radiometer for ground measurements making signature relationships, infrared ground-based instrumentation, and a Digital Multi-Spectral Video camera. The GPS and Survey Engineering Laboratory contains eight (8) geodetic-quality GPS receivers, a permanent differential GPS, reference stations with broadcast capabilities, and conventional survey equipment. The Battlefield Visualization Test Bed is an assemblage of high-speed computers and peripherals that uses various data sources and processing techniques to produce realistic images of terrain for battlefield scenarios. The TIES provides a capability for extracting up-to-date terrain data from remotely sensed images. The CMO provides TEC the capability to rapidly query status and order National Imagery in hardcopy or softcopy formats.

TEC's computer inventory includes many powerful independent work stations as well as personal computers for the majority of the workforce.

Topographic Engineering Center
 Alexandria, VA 22315-3864
 (703) 428-6654

Acting Director: COL Robert F. Kirby
 Commander: COL Robert F. Kirby

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.191	N/A	0.191
6.1 Other	2.281	0.134	2.415
6.2	6.278	4.870	11.148
6.3	4.684	30.444	35.128
Subtotal (S&T)	13.434	35.448	48.882
6.4	1.178	0.003	1.181
6.5	1.171	0.000	1.171
6.6	5.348	1.738	7.086
6.7	0.219	0.015	0.234
Non-DOD	0.207	0.081	0.288
TOTAL RDT&E	21.557	37.285	58.842
Procurement	0.683	0.049	0.732
Operations & Maintenance	11.624	2.878	14.502
Other	2.988	0.552	3.540
TOTAL FUNDING	36.852	40.764	77.616

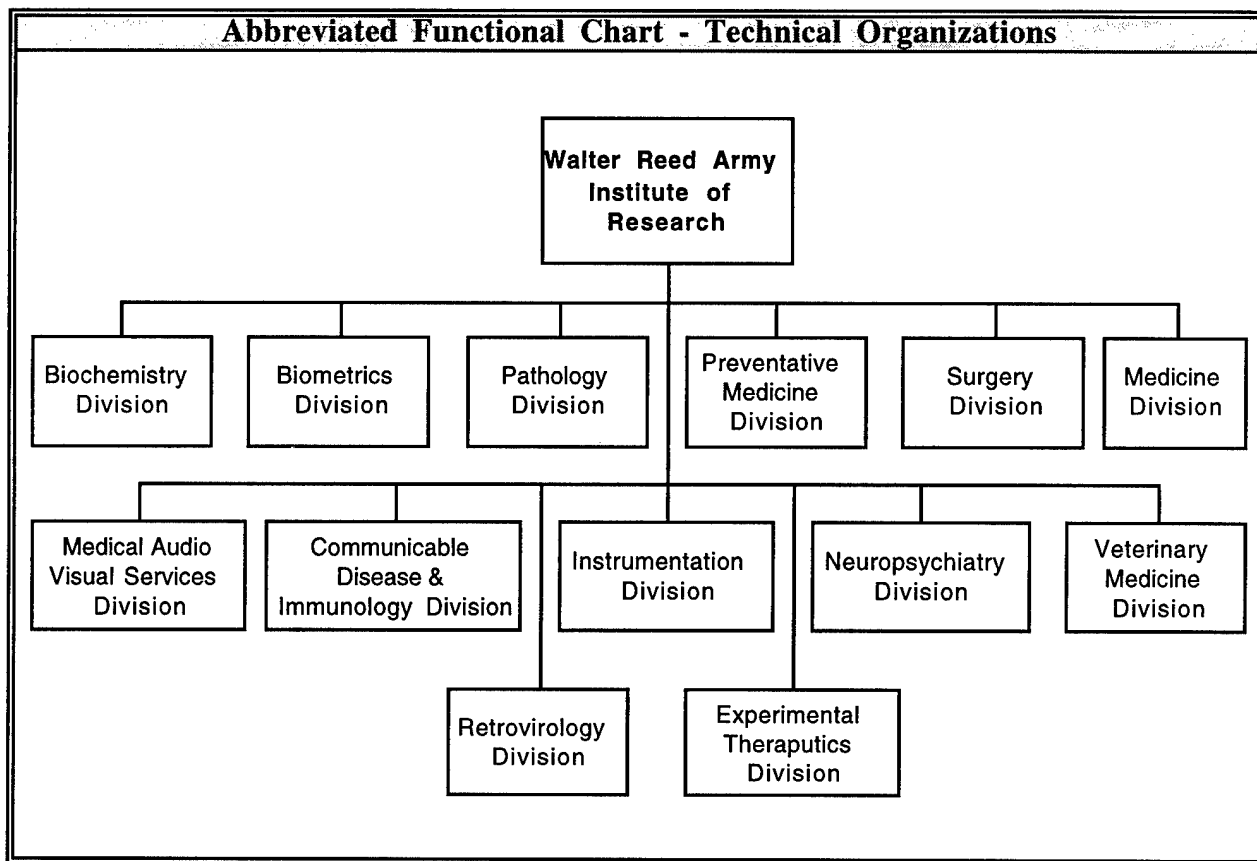
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.207

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	2	8	10
CIVILIAN	13	247	160	420
TOTAL	13	249	168	430

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ. FT.)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	88.776	REAL PROPERTY	22.400
ADMIN	35.081	* NEW CAPITAL EQUIPMENT	0.000
OTHER	53.134	EQUIPMENT	23.828
TOTAL	176.991	* NEW SCIENTIFIC & ENG. EQUIP.	2.405
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Walter Reed Army Institute of Research



Walter Reed Army Institute of Research
Washington, DC 20307-5100
(202) 782-3551

Director: COL Ernest T. Takafuji
Deputy Director: COL Martin H. Crumrine

MISSION

The Walter Reed Army Institute of Research (WRAIR) has one primary mission: biomedical research focused on soldier health and readiness. Whether in full scale war or in other operations, the WRAIR provides America's fighting men and women with the tools and knowledge to survive in hostile, disease-ridden, and health-threatening environments. The Institute fulfills its mission by conducting innovative research in naturally occurring infectious diseases, combat casualty care, operational health hazards, and medical defense against chemical and biological weapons.

CURRENT IMPORTANT PROGRAMS

Conduct research and develop drugs and vaccines to protect against infectious diseases to deployed soldiers. Conduct research and develop means to prevent operational stress in the combat environment. Conduct research and develop technologies for far forward combat casualty care and evacuation. Conduct research and develop strategies and technologies to prevent injuries from blast and directed energy sources and prevent shock following traumatic wounds. Conduct research to develop medical strategies for the protection of soldiers from chemical and biological warfare threats. Evaluation of military health hazards of Army weapon systems and manpower programs, in coordination with AMC, TRADOC, and ODSCPER. Transfer military medical science and technology into commercially viable products through cooperative research and development agreements, (CRADAS) outreach programs, and patent licensing, such as CRADAS with commercial companies on the development of drugs and vaccines to prevent malaria.

There are approximately 17 persons assigned to WRAIR under CRADAS.

EQUIPMENT/FACILITIES

Complete analytical chemistry capability to include gas chromatography and mass spectrometry; drug development from computer-aided drug design and synthesis to field testing for efficacy and safety; vaccine development from basic research and computer assisted recognition of relevant vaccine candidates to animal model development and production, testing and production, testing and licensing; complete infectious disease diagnosis to include isolation and culture of causative agents and serological diagnosis; perform comprehensive human behavioral research studies both in the laboratory setting and in the field; evaluate health hazards from blast, toxic, gas, and laser energy as well as materiel, and approaches to combat casualties from these same sources; perform complete epidemiology on military medical threats and accidents from infectious diseases and toxins; through pathological evaluation to include histopathological diagnosis and transmission and scanning electron microscopy studies; basic research studies into the pathophysiology of disease utilizing modern cell physiology and hematological techniques; testing of drugs, vaccines and medical doctrine in overseas locations in Brazil, Germany, Thailand and Kenya.

EQUIPMENT/FACILITIES (continued)

Facility Locations:

A. WRAMC AND FOREST GLEN

Headquarters and site of main research programs. The full spectrum of biomedical research is conducted to include: infectious disease and vaccine development research, HIV research, operational medicine, combat casualty care, and medical and chemical biological defense research.

B. CONUS DETACHMENTS

Wright Patterson Air Force Base - Occupational toxicology research.
Brooks Air Force Base - Medical effect of laser and microwave irradiation.
Blood Storage Preservation Research - located in leased space in Rockville.

C. OCONUS DETACHMENTS

US Army Medical Research Unit (USAMRU) - Germany - Operational Stress and Human Dimensions Research related to Operational Medicine.
USAMRU - Kenya - Infectious diseases endemic to Sub-Saharan Africa.
USAMRU - Brazil - Infectious diseases endemic to South America including malaria, leishmaniasis, dengue, shigella, and enteric diseases.
Armed Forces Research Institute of Medical Sciences (AFRIMS) - Bangkok Thailand - Infectious diseases and vaccine development for those diseases endemic to Southeast Asia to include malaria and HIV.

Walter Reed Army Institute of Research
Washington, DC 20307-5100
(202) 782-3551

Director: COL Ernest T. Takafuji
Deputy Director: COL Martin H. Crumrine

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	2.346	N/A	2.346
6.1 Other	12.582	0.893	13.475
6.2	28.623	1.170	29.793
6.3	10.382	0.893	11.275
Subtotal (S&T)	53.933	2.956	56.889
6.4	1.903	0.004	1.907
6.5	0.701	0.012	0.713
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	56.537	2.972	59.509
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	7.299	1.372	8.671
TOTAL FUNDING	63.836	4.344	68.180

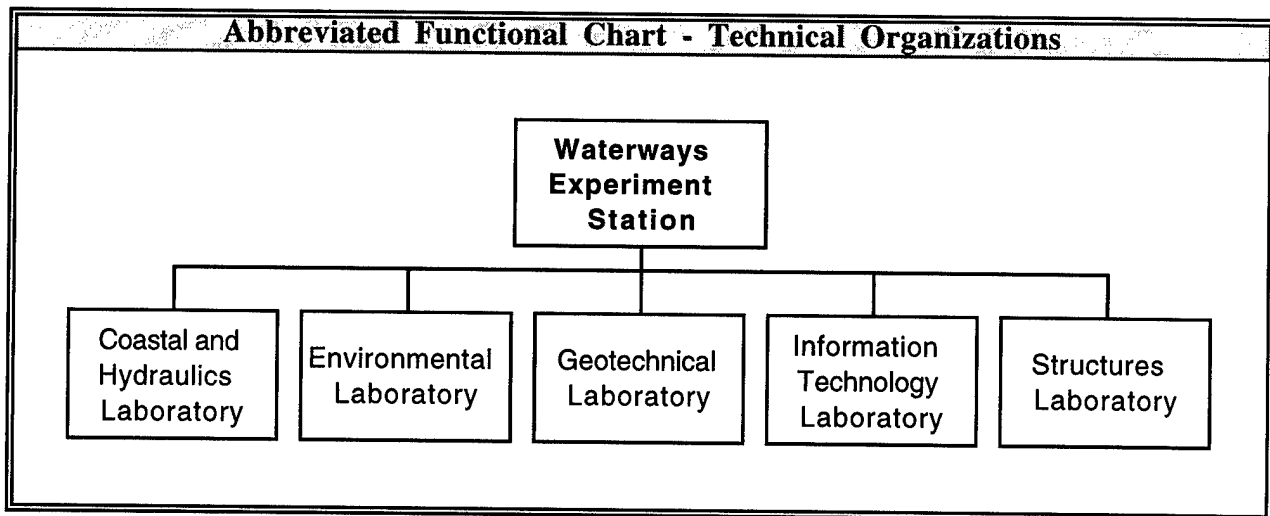
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	111	48	254	413
CIVILIAN	90	69	267	426
TOTAL	201	117	521	839

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	403.544	REAL PROPERTY	16.460
ADMIN	178.372	* NEW CAPITAL EQUIPMENT	0.000
OTHER	151.472	EQUIPMENT	64.311
TOTAL	733.388	* NEW SCIENTIFIC & ENG. EQUIP.	2.572
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Waterways Experiment Station



Waterways Experiment Station
Vicksburg, MS 39180-6199
(601) 634-2504

Director: Dr. Robert W. Whalin
Cdr & Dpty Dir: COL Bruce K. Howard

MISSION

The US Army Engineer Waterways Experiment Station (WES) is the largest Civil Engineering/Environmental Quality R&D complex in the Nation and is the Tri-Service Category 3 Reliance lead Laboratory in the Civil Engineering Areas of Airfields and Pavements, Survivability and Protective Structures, and Sustainment Engineering. WES is the Tri-Service Reliance lead Laboratory in the Environmental Quality subarea for Installation Restoration and the executing agency for the Office of the Secretary of Defense Joint Camouflage, Concealment, and Deception (JCCD) Joint Testing and Evaluation Program. WES operates and maintains the first DoD High Performance Computing Major Shared Resource Center for the Director, Defense Research and Engineering. The Tri-Service Computer Aided Design Drafting and Geographic Information System Technology Center is managed, operated and maintained by WES. The Corps of Engineers Central Processing Center is operated and maintained for the purpose of processing management information systems information for about 60% of Corps offices worldwide. WES manages 5 DoD Information Analysis Centers (IAC): Airfields, Pavements, and Mobility (IAC); Coastal Engineering (IAC); Concrete Technology (IAC); Hydraulic Engineering (IAC); and the Soil Mechanics (IAC). WES manages and executes 85% of the Army Corps of Engineer Civil Works Research and Development Program in the areas of hydraulic, coastal, geotechnical, structural, and environmental engineering, and in information technology. Primary research and development missions encompass weapons effects; fighting positions; terrorist threat protection; obstacle creation and reduction; fixed facility camouflage, concealment, and deception; vehicle/terrain interaction; military hydrology; lines of communications, construction, and repair; airfields and pavements; coastal engineering; coastal oceanography; littoral processes; hydraulic engineering; flood control and navigation; dynamic modeling and simulation; environmental impact; groundwater modeling; wetlands processes; environmental site characterization; ecosystem processes; reservoir, riverine, estuarine, and coastal water quality; mobility analyses; seismic response of structures; earthquake engineering; dredging and dredged material disposal; natural resources management; concrete technology; structural dynamics; and geotechnical engineering.

CURRENT IMPORTANT PROGRAMS

Unparalleled synergism exists between the \$107M US Army Civil Works Programs (listed as Non-DoD under FUNDING DATA) and the other DoD RDTE Programs. Construction materials and methods for rapid establishment of in-theater transportation network required for force protection; designs, materials, and construction practices for battlefield, fixed facility, and forward base survivability against advanced conventional and terrorist weapons; techniques for rapid obstacle creation; obstacle planning software for inclusion in the Army Tactical Command and Control System; accurate and reliable PC-based mobility models for command and control systems, combat models and simulations, and virtual prototyping; methodologies to predict coastal effects on Logistics-Over-The-Shore operations; Airfields and Pavements research for durable and cost-efficient pavements for roads, airfields, and other operating surfaces; effective remediation of sites contaminated with explosives, organics, and heavy metals; methods for investigation, characterization, and monitoring of potential hazardous waste sites; prediction of subsurface transport of contaminants in subsurface groundwater; effective chemical analysis techniques for accurate identification of suspected contaminants at DoD sites; execution of the DoD Joint Test and Evaluation for Camouflage Concealment, and Deception; National Wetlands Characterization and Restoration; Zebra Mussel research; Repair, Evaluation, Maintenance, and Rehabilitation; Aquatic Plant Control research program; Earthquake Engineering research, tunnel and underground facility detection research; and the Dredging Operations and Environmental Research Program. Technology Transfer Activities include: eleven Cooperative Research and Development Agreements were signed, seven Patent License Agreements were signed, and two additional patent licenses were in negotiations.

EQUIPMENT/FACILITIES

The US Army Engineer Waterways Experiment Station (WES) has an unmatched combination of experimental and computational facilities for research in hydraulic, geotechnical, structural, environmental, and coastal engineering, and information technology. Some of the more significant facilities are:

Hazardous and Toxic Waste Research Center (HTWRC) (17,000 sq ft): This is the only DoD-permitted (RCRA) facility to conduct large volume HTW research, development, test, and evaluation. EPA recognizes the HTWRC as the Nation's premier facility.

Fate and Effects R&D Center (30,000 sq ft): Complete experimental radioisotope, microbiology, toxicity, and instrumentation laboratories for investigations of contaminant fate and effects on ecosystems.

DoD High Performance Computing Major Shared Resource Center (55,000 sq ft): Includes multiple, state-of-the-art High Performance Computing systems which provide the most powerful scientific and engineering capability in DoD with 7000+ MegaWords of memory, 1200 Gigabytes of high-speed disk, and 500 Terabytes of high-speed robotic archival storage. Includes a \$4.1M Scientific Visualization Center to identify and develop innovative methods of interpreting large data sets from modeling/simulation, field data collection, and Computer Aided Design and Drafting (CADD) applications.

Airfields & Pavements Research Center (25,000 sq ft): State-of-the-art facility contains the DoD unique Joint Sealant Laboratory and an Automated Data Acquisition System for acquiring rheological data on creep, strength, resilient moduli, and fatigue of a variety of paving materials.

Soils Research Center (10,000 sq ft): The largest soils mechanic research facility in DoD, it has a loading capability of 250,000-lb on triaxial specimens up to 15-in. in diameter.

Mass Construction Materials Laboratory (20,000 sq ft): A concrete research and development facility for determining physical, chemical, and mineralogical properties of concrete and other construction materials as well as the structural response of subscale models.

Full-Scale Aircraft Loading Facility: Simulates aircraft loading with different wheel loads and gear geometry applied to full scale constructed test pavements; response and performance data for development of new design models and behavior theories; current fighter and transport aircraft simulators.

Projectile Penetration Facility: Unique to DoD, this facility enables investigation of anti-penetration shielding technology techniques employing geologic and manmade structural materials against a wide variety of projectile threats.

Coastal Facilities: Approximately 400,000 sq ft under roof for 3-D high-precision coastal experiments. Contains over 850-ft of spectral wave generators (including the 90-ft long Directional Spectral Wave Generator) designed to reproduce waves up to 2-ft in height.

Field Research Facility, Duck, NC (175 acres): Recognized worldwide for cooperative multi-national and multi-agency field experiments in coastal and nearshore processes; 1970-ft concrete and steel pier, 1 mile of beachfront, full suite of installed coastal processes instrumentation, special purpose beach and amphibious vehicles, etc.

Riprap Test Facility: The largest curved channel test facility of its kind, used for study of effects of channel bendways on flow fields, specifically aimed at developing design criteria for riprap protection of bendways.

EQUIPMENT/FACILITIES (continued)

Mobility Instrumentation Facility: 30,000 sq ft complex for conducting research and development investigations of cross-country mobility, trafficability, and terrain data acquisition. This research requires complex design and fabrication of real-time data collection and analysis hardware unique to quantifying the performance of all types of wheeled, tracked, and amphibious military vehicles. A 14,000 sq ft annex is optimally structured to support modeling and simulation capabilities in distributive interactive simulations and virtual prototyping in support of battlefield automation.

Environmental Chemistry Laboratory: 7,000 sq ft state-of-the-art analytical laboratory supporting the total spectrum of DoD environmental research and development investigations and technical assistance requirements.

Aquatic and Wetlands Ecosystem Research Center: 10,000 sq ft facility provides capability to evaluate the impact of DoD activities on aquatic and wetland ecosystems, including impacts on threatened and endangered species, and wetland identification, delineation, and evaluation.

Geophysics Research, Applications, and Test Facilities: the most extensive near-surface geophysics equipment and applications capability in DoD. Specializing in engineering, environmental, archeological, and groundwater geophysics, the facilities support the DoD requirements for foundation investigations, installation restoration, cultural resource assessments, military groundwater supply, tunnel detection, and environmental site characterization. In addition, a 15,000 sq foot Engineering Geophysics Training facility consisting of metallic and non-metallic targets buried at various depths and orientations, is used for evaluating geophysical instruments and providing hands-on training with the equipment.

Centrifuge Research Center: Uniquely large and powerful, the research centrifuge weighs 85 tons and has a 21-ft radius; it can apply a maximum g-force of 1256 g-tons operating at 350g's for a 23.1 ton payload and at 143g's for an 8.8 ton payload (1g = normal gravity). This unique facility provides the capability to replicate a 27.5-year event in one day and has the ability to conduct research in all areas of civil and environmental engineering including earthquake engineering, coastal engineering, structural engineering, blast phenomena, and groundwater behavior.

Mobile Penetration Research Facility: provides the DoD with the capability to conduct projectile penetration field experiments at various geologic sites of interest. The truck-mounted, breach-loaded ballistic gun can launch large-scale (up to 155-mm) projectiles at velocities as high as 1km/sec. Associated diagnostic instrumentation and analysis hardware are contained within a support trailer.

Waterways Experiment Station
 Vicksburg, MS 39180-6199
 (601) 634-2504

Director: Dr. Robert W. Whalin
 Cdr & Dpty Dir: COL Bruce K. Howard

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.256	N/A	0.256
6.1 Other	2.198	1.227	3.425
6.2	80.526	19.627	100.153
6.3	14.388	5.952	20.340
Subtotal (S&T)	97.368	26.806	124.174
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	4.767	1.447	6.214
6.7	0.000	0.000	0.000
Non-DOD	89.461	17.855	107.316
TOTAL RDT&E	191.596	46.108	237.704
Procurement	0.065	0.000	0.065
Operations & Maintenance	18.659	6.941	25.600
Other	0.482	0.419	0.901
TOTAL FUNDING	210.802	53.468	264.270

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.816

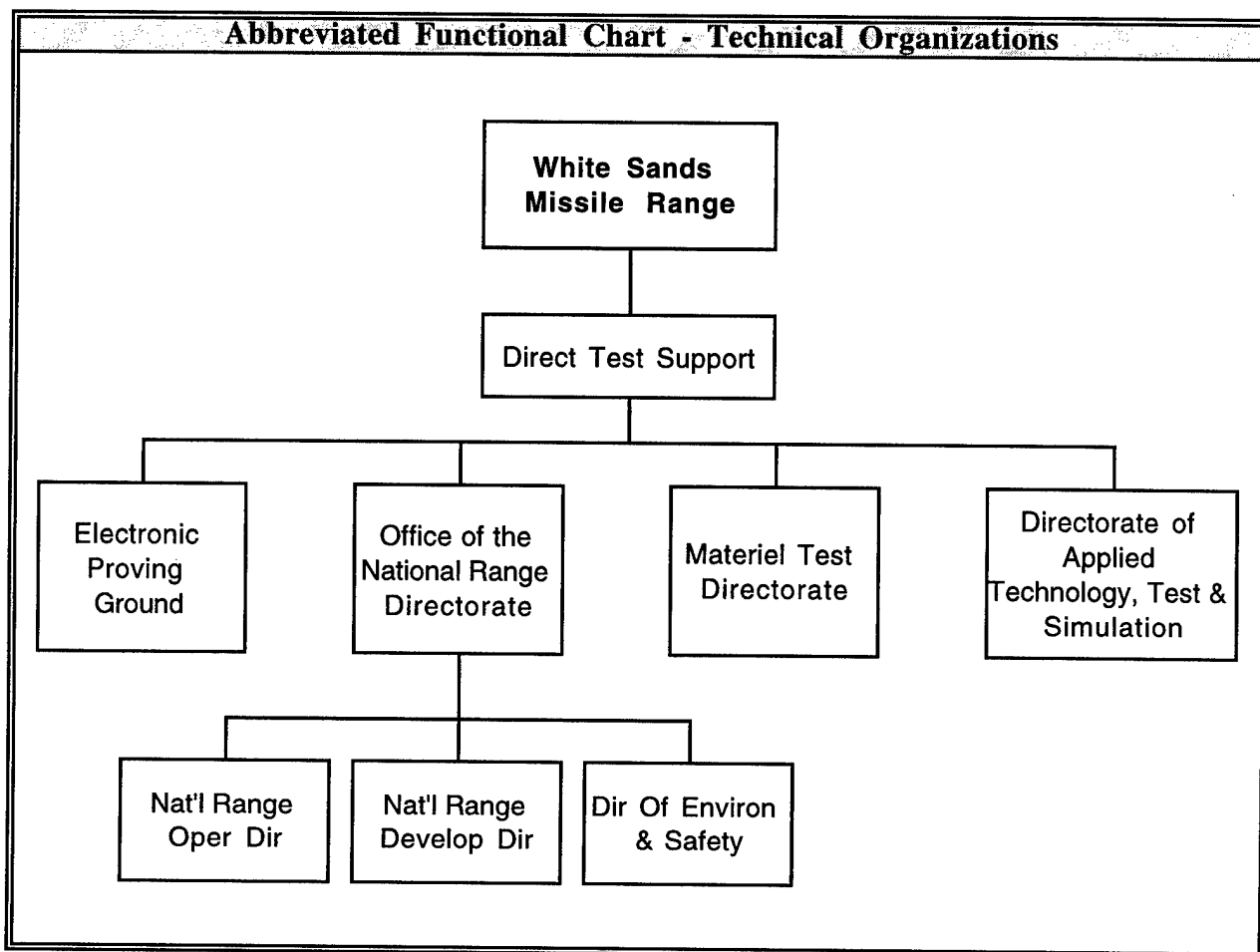
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	9	0	9
CIVILIAN	192	493	699	1,384
TOTAL	192	502	699	1,393

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	2,555.940	REAL PROPERTY	486.000
ADMIN	234.240	* NEW CAPITAL EQUIPMENT	4.000
OTHER	48.330	EQUIPMENT	530.000
TOTAL	2,838.510	* NEW SCIENTIFIC & ENG. EQUIP.	50.000
ACRES	2,705	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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White Sands Missile Range



White Sands Missile Range

White Sands Missile, NM 88002-5000
(505) 678-2121

Commander: BG Jerry L. Laws
Technical Dir.: George A. Orlicki

MISSION

WSMR's mission is to provide quality management and operation of the premiere MRTFB with a unique combination of real estate, airspace, instrumentation, laboratories, launch facilities, and technical expertise, to support the RDT&E requirements of the Tri-Services, DoD agencies, other government agencies, commercial entities and foreign governments. WSMR supports the full range of Command, Control, communications, and Intelligence (C4I) systems, electromagnetic effects and nuclear environments testing. Due to the large land mass and controlled airspace, WSMR supports a variety of combat training activities. To support advanced weapons testing, WSMR is a key resource for development of state-of-the-art instrumentation, not only for WSMR, but for the entire MRTFB community. C4I testing is conducted by WSMR/Electronic Proving Ground (EPG) located at Fort Huachuca, AZ and Fort Lewis, WA. We challenge, enrich, and develop our most precious asset, our human resources, while continuing to improve productivity and quality of life.

CURRENT IMPORTANT PROGRAMS

Army-Patriot, Army Tactical Missile System (ATACMS), Theater High Altitude Area Defense (THAAD), Advanced Medium Range Air-to-Air Missile (AMRAAM), Standard Missile (SM), Multiple Launch Rocket System (MLRS), Theater Missile Defense Programs (TMDP), Research Rockets, Advanced Short Range Air-to-Air Missile (ASRAAM), Extended Sea Sparrow Missile (ESSM), Space Shuttle, and Tactical Training Program.

Unmanned Aerial Vehicle, Army Tactical Command and Control System, Enhanced Position Location Reporting Systems, Global Positioning System, All Source Analysis System, Single Channel Ground and Airborne Radio Systems, Intel and Electronic Warfare, Counter Technology Assessment Center Support to Office of National Drug Control Policy (Cactus Wren), Advanced Warfighting Experiments, and Satellite Test Bed.

EQUIPMENT/FACILITIES

White Sands Missile Range, including the Electronic Proving Ground, Fort Huachuca, AZ, has a variety of equipment, facilities and features that make it a premier test range. These features include: the largest overland test range, WSMR managed restricted airspace and varied terrain features. WSMR also has range instrumentation which includes the Multiple Object Tracking Radar (MOTR), Air surveillance System, Miss Distance Indicating (MIDI) Radar, WEIBEL Radar, Remote Control Optical Tracking Mounts, Global Positioning System (GPS) and Telemetry and Radar Instrumentation. WSMR has a complete environmental and scientific laboratory suite (including a Microbiological Test Chamber, Large Environmental Test Chamber, Chemistry Lab, Metallurgy Lab, and Dynamics Lab) and Nuclear Effects Testing Facilities such as the Solar Furnace, Electromagnetic Pulse, Linear Electron Accelerator, Electromagnetic Radiation Effects transmitters and the Large Blast Thermal Simulator. The Big Crow is an airborne electronic warfare asset that includes and aircraft and helicopters. WSMR is also the site of the Aerial Cable Range, a three mile cable suspended from two mountain peaks. The Smart Munitions Test Suite allows us to track submunitions. At our Electronic Proving Ground site we operate the Electromagnetic Environment Test Facility using computer modeling/simulation, C4I, hardware-in-the-loop and controlled field test environment. We also operate the System Interoperability Computer Software Test Facility, the Realistic Battlefield Frequency Measurement Environment Facility, the EMI/EMC/Tempest Transverse Electromagnetic/Reverberation Chamber and operate the Antenna Test Measurement Facility. 12,000 foot paved runway. Paved and unimproved UAV runways.

White Sands Missile Range

White Sands Missile, NM 88002-5000
(505) 678-2121

Commander: BG Jerry L. Laws
Technical Dir.: George A. Orlicki

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.734	0.227	0.961
6.3	3.906	2.484	6.390
Subtotal (S&T)	4.640	2.711	7.351
6.4	5.133	4.255	9.388
6.5	163.035	31.701	194.736
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	25.627	48.220	73.847
TOTAL RDT&E	198.435	86.887	285.322
Procurement	14.937	8.169	23.106
Operations & Maintenance	5.714	7.949	13.663
Other	4.326	4.100	8.426
TOTAL FUNDING	223.412	107.105	330.517

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

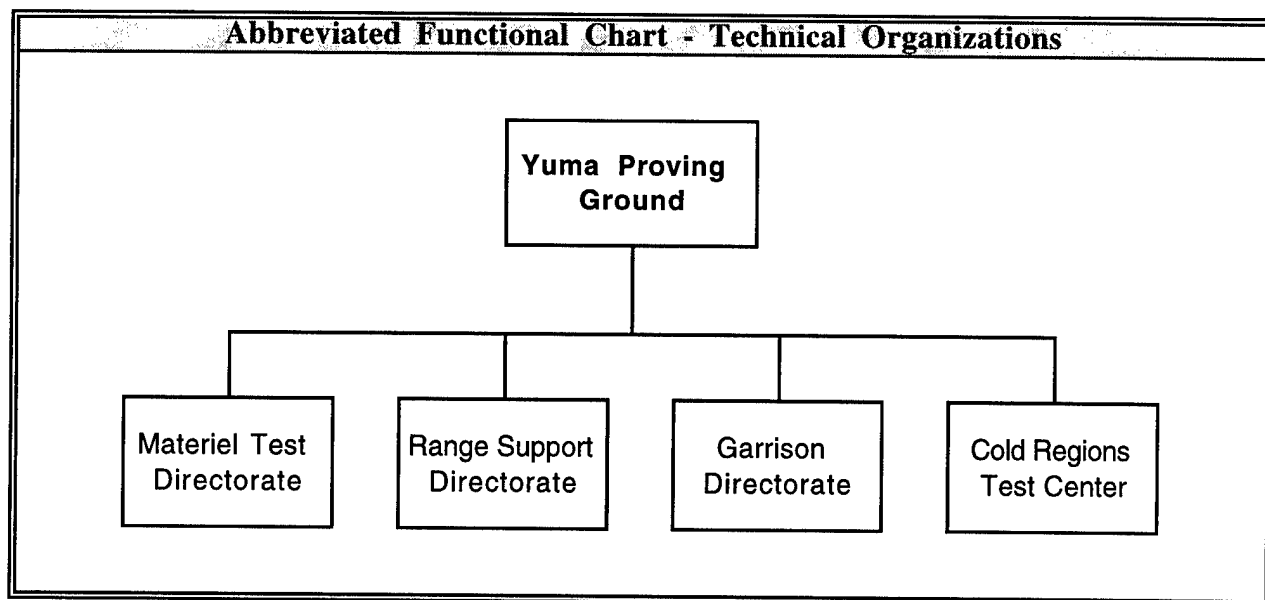
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	1	8	715	724
CIVILIAN	13	616	1,659	2,288
TOTAL	14	624	2,374	3,012

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,869.600	REAL PROPERTY	509.100
ADMIN	957.500	* NEW CAPITAL EQUIPMENT	13.200
OTHER	1,530.600	EQUIPMENT	541.100
TOTAL	4,357.700	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	2,310,798	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Yuma Proving Ground



Yuma Proving Ground
Yuma, AZ 85365-9102
(520) 328-2163

Commander: COL Robert C. Filbey
Technical Dir: James L. Wymer

MISSION

Plan, conduct, analyze and report the results of development and other tests of aircraft weapons, long-range artillery, military vehicles, armored vehicles, tank weapons, munitions of all types and aerial delivery systems (parachutes). YPG also conducts tests of military equipment in the natural desert terrain and environment. YPG has responsibility for natural environment testing at the Cold Regions Test Center (Alaska) and Tropic Test Site (Panama).

CURRENT IMPORTANT PROGRAMS

M1-A1 Abrams Tank
M-2 Bradley IFV
Palletized Load System (PLS)
Search and Destroy Armor (SADARM)
Tank Main Armament System (TMAS)
Liquid/Propellant Gun
C-17 Cargo Aircraft
Low Altitude Retrorocket Recovery System (LARRS)
OH-58D Kiowa Warrior
Unmanned Aerial Vehicle Close Range (UAV-CR)
RAH-66 Comanche Target Acquisition Systems
AH-64D Apache Longbow
Wide Area Mine (WAM)
SafeAir
Cold Weather Clothing and Equipment

EQUIPMENT/FACILITIES

WEAPONS FIRING CHAMBER: Capable of testing full-sized combat/tactical vehicles and helicopters, artillery and direct fire systems from -65°F to 160°F with humidity from 5% to 95%.

WEAPONS ACCURACY RANGE: The artillery range is sufficiently large to fire all artillery to maximum range and is fully instrumented with radar, multi-camera tracking mounts, telemetry and microwave systems, specially developed instrumented impact fields and communications systems. The aircraft weapons range is specially developed for helicopter armament and instrumented with multiple laser trackers, radars, telemetry video, multi-camera tracking mounts, remote control moving targets, GPS-based moving target tracking system and integrated real-time mission control and data processing center. The aircraft range includes specialty sites for ground mounted tests of aircraft weapons. All range areas are under restricted airspace to a minimum of 80,000 ft,

AUTOMOTIVE TEST COURSES: Paved, unpaved, hilly, Middle East, gravel, dust, fording basin, vehicle swimming, dynamometer capability for all Army systems. Complete shop and overhaul capability for Army vehicles and weapons systems.

AIR CARGO TEST FACILITY: Army airfield, two (2) runways to 6,000 ft., two (2) hangars, Air Cargo Complex for test of airdrop systems and airdrop qualification of military systems and ammunition.

TEST ENVIRONMENT: Complete environment test capability including 30,000 lb vibration tables, rain, humidity, dust and other chambers. Laboratory facilities including X-ray, chemical and materials lab.

NATURAL ENVIRONMENT: Cold weather, tropic and desert testing.

Yuma Proving Ground
 Yuma, AZ 85365-9101
 (520) 328-2163

Commander: COL Robert C. Filbey
 Technical Dir: James L. Wymer

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	19.913	76.914	96.827
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	19.913	76.914	96.827
Procurement	2.633	1.761	4.394
Operations & Maintenance	4.591	4.595	9.186
Other	10.959	6.553	17.512
TOTAL FUNDING	38.096	89.823	127.919

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	0	170	170
CIVILIAN	0	152	588	740
TOTAL	0	152	758	910

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	28.200	REAL PROPERTY	141.300
ADMIN	153.300	* NEW CAPITAL EQUIPMENT	28.700
OTHER	1,972.500	EQUIPMENT	228.655
TOTAL	2,154.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.601
ACRES	1,009,352	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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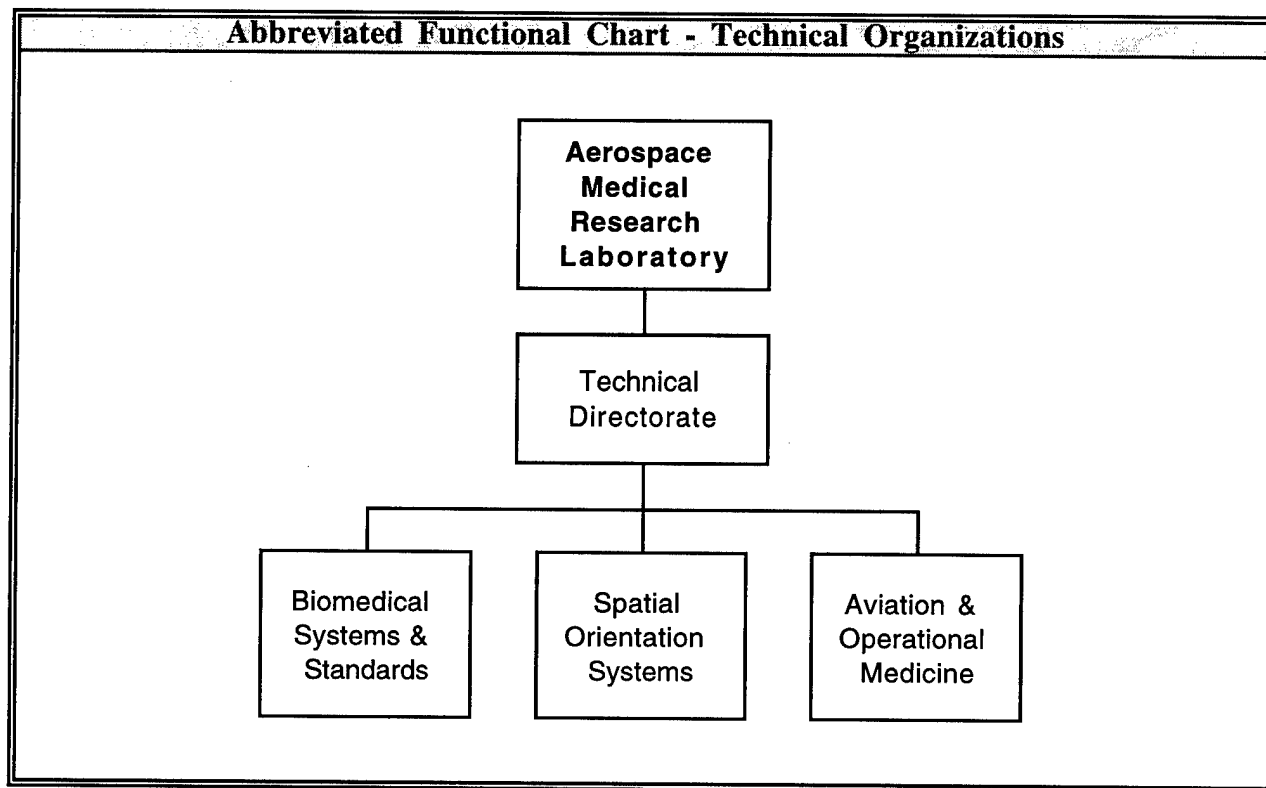
DEPARTMENT OF THE NAVY

DEPARTMENT OF THE NAVY

The Navy's sixteen (16) In-House RDT&E Activities are:

Naval Aerospace Medical Research Laboratory	3-2
Naval Air Warfare Center	3-6
Naval Biodynamics Laboratory	3-14
Navy Clothing and Textile Research Facility	3-18
Naval Command, Control and Ocean Surveillance Center	3-22
Naval Dental Research Institute	3-28
Naval Facilities Engineering Services Center	3-32
Naval Health Research Center	3-36
Naval Medical Research Institute.....	3-40
Naval Medical Research Unit #2	3-46
Naval Medical Research Unit #3	3-50
Navy Personnel Research and Development Center	3-54
Naval Research Laboratory.....	3-58
Naval Submarine Medical Research Laboratory	3-64
Naval Surface Warfare Center	3-68
Naval Undersea Warfare Center.....	3-80

Naval Aerospace Medical Research Laboratory



Naval Aerospace Medical Research Laboratory
Pensacola, FL 32508-1046
(904) 452-3286

CO: Captain L.H. Frank, MSC
Chief Scientist: Dr. Robert Stanny

MISSION

The laboratory's mission is to conduct research and development in aviation medicine and allied sciences to enhance the health, safety, and readiness of Navy and Marine Corps personnel, and to perform such other functions or tasks as may be required by higher authority.

CURRENT IMPORTANT PROGRAMS

Vestibular transduction, motion perception and motion sickness; performance-based medical standards for naval aviation; vision standards; night vision devices (NVDs); development of new generations of NVDs based on digital enhancement of infrared and standard NVD images; development of hearing protection devices; auditory standards; vibrotactile stimulation for enhancing spatial orientation and navigation; development of gender-neutral strength standards for aviation; aviation-selection test development and computerization, development of widely networkable test systems.

EQUIPMENT/FACILITIES

The VISION LABORATORY includes a mobile night vision device (NVD) training facility ('NITE Lab') that can be used to train NVD users in the field. The 'NITE Lab' is equipped with numerous NVD demonstrations and training aids as well as optical testing and vision equipment. The laboratory has facilities for recording, digitizing, and mathematically filtering and enhancing visual images. In cooperation with the helicopter training facility at Whiting Field (TRAWING FIVE), the laboratory is able to noninvasively record the instrument scan patterns of pilots flying the motion-based, full-scale helicopter instrument trainer.

The PSYCHOACOUSTICS LABORATORY includes acoustical test chambers, a Real-Ear Attenuation Test Facility (ANSI standard compliant), a semi-reverberant test chamber for simulating various Navy operational environments, and a high-level noise test chamber. In addition, equipment supporting analog and digital signal processing, speech analysis, spectral analysis, and radio voice communications monitoring is resident. The laboratory also houses unique equipment to design, fabricate, and test innovative hearing protective ear cups.

The SPATIAL DISORIENTATION LABORATORY capability is a unique national asset consisting of many one-of-a-kind research devices. The CORIOLIS ACCELERATION PLATFORM (CAP) is the only device worldwide capable of applying combined linear and angular acceleration to the human subject. It is also the only device in the DoD inventory available to study chronic exposure to altered G environments. The CAP is a combined linear and angular motion device. It uses two, independently controlled power servomechanism drive systems to generate acceleration stimuli caused by rotation about an Earth-vertical axis and/or rectilinear translation along an Earth-horizontal axis. This device has enabled scientists to make accurate simulations of many bizarre combinations of force stimuli and their effects on aerospace crewmen under carefully controlled conditions. Data gathered in various studies using the CAP continue to contribute significantly to the success of the space program and to the safety and well-being of astronauts.

The PENDULAR INERTIAL GRAVITATIONAL (PIG) devices (PIG 1A and PIG 1B) are fixed on the CAP linear track and are used to position a human subject at various angles off vertical axis while the CAP room is rotated. The PIGs can be oriented in four different directions.

EQUIPMENT/FACILITIES (continued)

The Vertifuge or DYNAMIC SIMULATOR (DYNASIM) was installed for research on spatial awareness. This device consists of three main components: a motion system, a visual surround for presenting Earth-fixed or moving targets, and a computer-controlled system. The Vertifuge is currently being used to study pilot disorientation, which has been the direct cause of numerous accidents resulting in loss of life and hundreds of millions of dollars worth of aircraft.

The EQUITEST SYSTEM employs computerized dynamic posturography to systematically examine the effectiveness of visual, vestibular, and somatosensory inputs to balance and the timing, strength, and coordination of postural movements. This permits evaluating visual, vestibular, and somatosensory contributions to equilibrium.

The PATE DEVICE resembles a patient litter and is capable of rotating a subject about the longitudinal body axis and/or the horizontal axis through the pelvis. This apparatus has slip rings, which permit physiological monitoring, and is currently being used to study eye movements in response to rotation or perceived motion generated by moving patterns projected on a hemispheric screen in front of the subject.

The HUMAN DISORIENTATION DEVICE (HDD) is capable of accelerating an instrumented human subject about two head-centered axes simultaneously. It is used to help differentiate the relative roles played by the various sensory systems involved in the production of disorientation, as well as to examine the contribution of each system and subsystem to motion sickness. The HDD is another instrument employed in studying the effects of disorientation caused by rotation and tumbling. The HDD differs substantially from the Pate device in that the axes of rotation can be made to pass through the intersection of the interaural and naso-occipital lines. It permits isolation of function and stimulation of specific portions of the organs of balance in the middle ear. This device has provided direct support for many basic and applied research projects sponsored by both the Navy and NASA.

The OCULAR COUNTERROLL DEVICE is used to measure ocular counterroll in response to total body tilting movement and provide information on possible changes related to aging.

The OFF-VERTICAL-ROTATOR (OVR) is used to gain measures of semicircular canal and otolith function and related spatial orientation performance.

The PERIODIC ANGULAR ROTATOR (PAR) is a novel servomotor designed for studies of the dynamic response of the vestibulo-ocular system. The PAR is a high-performance motion-inducing instrument that rotates a seated subject about the Earth-vertical axis in a wide variety of stimulus waveforms.

We have three ENVIRONMENTAL CHAMBERS, two of which are in adjacent rooms. One is 8 x 8 ft and the other is 10 x 16 ft. The smaller room is used primarily for cold exposure. It has active temperature control from -5 to 25 degrees C. The larger room has active temperature control from 0 to 50 degrees C. The third environmental chamber is a free-standing room 8 x 10 ft with precise temperature (0-60 degrees C) and humidity (20-80%) control.

This command has developed several MOBILE FIELD LABORATORIES to conduct specialized clinical and research tests evaluating the visual, vestibular, and auditory sensory systems. These tests, by virtue of the trailers' mobility, permit our researchers to collect data at training bases, in the operational settings of the Marine Corps, and on board ships.

Naval Aerospace Medical Research Laboratory
Pensacola, FL 32508-1046
(904) 452-3286

CO: Captain L.H. Frank, MSC
Chief Scientist: Dr. Robert Stanny

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.646	0.083	0.729
6.3	0.505	0.011	0.516
Subtotal (S&T)	1.151	0.094	1.245
6.4	0.433	0.000	0.433
6.5	0.312	0.304	0.616
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	1.764	0.087	1.851
TOTAL RDT&E	3.660	0.485	4.145
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	0.000	0.000	0.000
TOTAL FUNDING	3.660	0.485	4.145

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

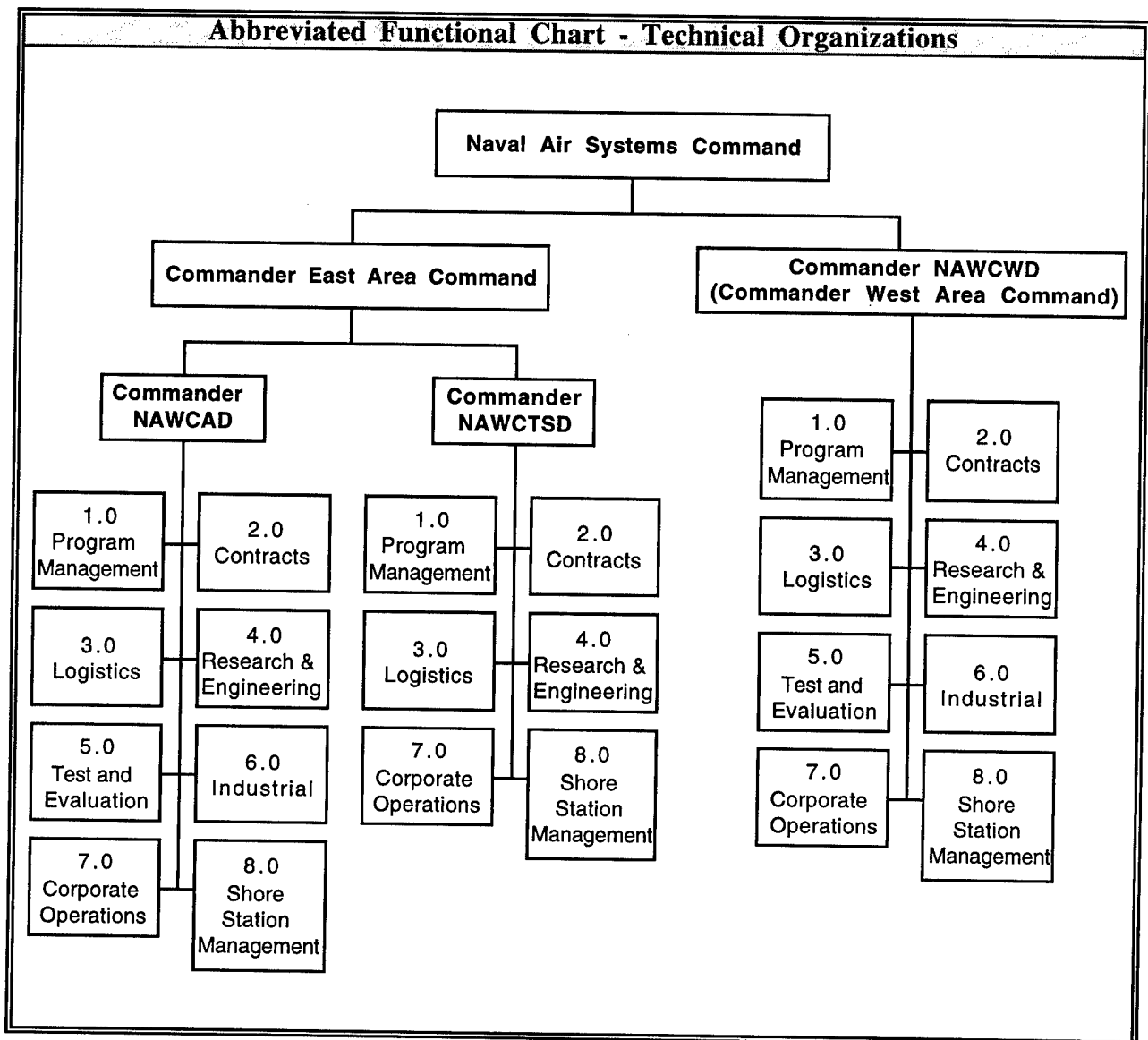
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	9	7	13	29
CIVILIAN	6	4	26	36
TOTAL	15	11	39	65

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	102.936	REAL PROPERTY	12.838
ADMIN	6.648	* NEW CAPITAL EQUIPMENT	0.000
OTHER	10.237	EQUIPMENT	11.076
TOTAL	119.821	* NEW SCIENTIFIC & ENG. EQUIP.	0.304
ACRES	3	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Air Warfare Center

Abbreviated Functional Chart - Technical Organizations



Naval Air Warfare Center
Arlington, VA 22243
(703) 604-6033

Commander: VADM John A. Lockard
Deputy Commander: Dr. Alan Somoroff

MISSION

Our mission is to be the Navy's full spectrum research, development, test and evaluation, engineering, and fleet support center for air platforms, autonomous air vehicles, missiles, weapons and sensors used to conduct air warfare; and to be the principal Navy center for acquisition and product support of training systems.

The Naval Air Warfare Center is composed of three Divisions: The Aircraft, Weapons and Training Systems Divisions. The Commander of the Training Systems Division reports to the Commander, Aircraft Division who is also designated as the Commander, East Area Command. The Commanders of the Aircraft and Weapons Division report directly to the Commander of the Naval Air Systems Command who holds responsibility for the Naval Air Warfare Center activity.

CURRENT IMPORTANT PROGRAMS

EAST AREA COMMAND

AIRCRAFT DIVISION

AIRCRAFT SYSTEMS & TACTICAL AIRCRAFT SYSTEMS: C-3 Technology, E-2 Squadrons, F/A-18, F/A-18EF, V-22, JAST, T800 (LNX) Engine Qualification Program, Unmanned Air Vehicle, Aircraft Materials, Air Crew Systems Development, Airborne ASW Surveillance, Aviation Survivability, Carrier Systems Development, IFF System Development, Aircraft Technology, RDT&E; Ship Support, Aviation Improvements.

ELECTRONIC WARFARE: TACAIR EW Electro-Optics and Infrared R&D, Electronic Research, EW Development.

ANTI-SURFACE WARFARE: Undersea Warfare Advance Technology, ASW System Development.

TECHNOLOGY BASE: Sensors/seekers (AIR, EO, RF) Propulsion, Materials Technology, IHPTET Program Management, Weapons and Aircraft Modeling and Analysis, Mission Support Technology, Air Systems and Weapon Advanced Technology, Shipboard Aviations Systems, Acoustic Search Sensors, Target Systems Development, Standards Development, Navy Strategic Communications, Advance Technology Transition T&E Support, Major T&E Investment, NAVSTAR GPS Equipment, In House Independent Laboratory Research Materials-Electronics and Computer Technology Readiness Training Environmental Qual. Tech., Fleet Tech. Support.

TRAINER PROGRAMS: Research and Technology development in Instructional Technology, Simulator Networking, Tactical Decision Making Under Stress, Embedded Training Technology, Deployable Training, Virtual Environmental Training, Sensor Simulation, Weapons Teams Simulation, Scenario Development, Simulator Sickness, Aircrew Coordination and Software Technology for Adaptable Reliable Systems, Consolidated Training Systems Development, Fleet Air Training.

AIR LAUNCH RECOVERY EQUIPMENT (ALRE): Electromagnetic Aircraft Launch Systems (EMALS), Radfale Aircraft Support.

COMMON SUPPORT EQUIPMENT (CSE): Standard Engine Test Systems (SETS), Universal Jet Air Start Unit (UNIJASU), Consolidated Automatic Support System (CASS).

CURRENT IMPORTANT PROGRAMS (continued)

OTHER: Vessel Tracking System, Propulsion/Materials exploratory and advanced development product support, targets and simulators for air-launched systems, threat simulator development, operation of land and sea ranges.

TRAINING SYSTEMS DIVISION

RESEARCH AND TECHNOLOGY

Instructional Technology, Simulation Technology, Tactical Decision Making Under Stress, Embedded Training Technology, Deployable Training, Virtual Environment Training Technology, Sensor Simulation, Weapons Teams Simulation, Scenario Development, Training Effectiveness Assessment Methodology, Transportable Strike/Assault Rehearsal Systems, SBIR, Distributed/Joint Training, and Technology Transfer including the following Cooperative Research and Development Agreements (CRADAs):

Commercialization of Simulation Technology: Investigate the commercialization of military technology for entertainment applications.

Firearms Training Systems for Commercial Applications: Application of research methods to demonstrate and evaluate firearms training systems for commercial applications.

Transportability of Flight and Simulation Software To Digital Equipment Company (DEC) Equipment: Demonstrating and evaluating the probability of simulation software to DEC equipment in support of Distributive Interactive Systems (DIS).

Network Interface Unit for DIS: Collaborate on DIS projects.

Commercialization of the 3Defender Firearms Training Systems: Utilizing the design and existing first article, Develop a commercial grade model of the 3Defender Firearms Training System.

Prototype Training Systems Using Low Cost PC Based Image Generator Technology: Jointly develop and assess rapid prototypes of training systems using P10, a PC-based image Generator and supporting software.

MARINE CORPS GROUND PROGRAMS

Advanced Assault Amphibious Vehicle, Assault Amphibious Vehicle, Combat Vehicle Training Systems, Combined Arms Staff Trainer, Contractor Operation and Maintenance of Simulators, Light Armored Vehicle (Air Defense/Anti-Tank), Modeling and Simulation/Distributed Interactive Simulation, Multiple Integrated Laser Engagement System 2000, Precision Gunnery Training System, Range Instrumentation System, Team Target Engagement System, Training Situation Analyses (various), and Universal Maintenance Training System.

AVIATION

EA-6B, F-14, A-6E, S-3, E-2C/C-2A, P-3, SH-2&3, SH-60B/F, T-45, T-34/44, TA-4/T-2, UNFO, JPATS, LSO, ATC, AV-8B, KC-130, V-22, AH-1W, CH-46, CH-53, UH-1N, F/A-18, HH-65, COMS/CSI/CACT/ISD/ICW, A-School, HH-60J, MH-53, AUTEK, E-6A, UAV, JTCTS, TRADEM, TOURS, TSRA TOOLS, UNFO, TH-57C, V-22, OTT, FAA, EP-3/ES-3 (MAST), C2P, TIDES, Naval Aviation Survival Training Program, Joint Aviation Strike Technology, Joint Acquisition Management System.

CURRENT IMPORTANT PROGRAMS (continued)**SURFACE**

Close in Weapons Systems, Naval gunfire System, Bridge/CIC Trainer, Mobile Pierside Trainers, Forward Observer Training System, ASW Team Training, Propulsion, Fire-Fighting Trainers, Landing Craft Air Cushion Trainer, Seal Delivery Vehicle Trainer, COMS, Propulsion Trainers, Battle Force Team Training, Maritime Component Training, Barge Ferry Trainer, Small Arms Marksmanship Trainer, General Mechanical Maintenance Trainer, LPD-17, SC21, CV(X), Foreign Military Program, and Coast Guard: Buoy Tenders, On-scene coordinator, Shipboard Command and Control System, Icebreaker, Coastal Patrol Boat, Vessel Traffic Service, Oil Spill Management System.

UNDERSEA

Seawolf, Trident, New SSN, Damage Control, Integrated Undersea Surveillance System, SSN 688, Ship Control Systems, Navigation Piloting, SSN Torpedo Room Trainer, Authoring of Instructional Materials, COMS, Submarine Battle Force Team Training, Sub-employment, Training Technology, Tactical Advanced Computer Operator and Maintenance Labs, and Computer Improved Instructor's Training Aid.

BATTLEFORCE

E6A, Joint Tactical Combat Training System, Unmanned Aerial Vehicle, Atlantic Undersea Test and Evaluation Center, Common Acoustic Data Base, Threat/Intelligence Data Extraction (TIDES), Office of Training Technology, Joint Training Analysis & Simulation Center, Modeling and Simulation, Federation of Systems Analysis Directors, Distributed Interactive Simulation Network Interface Unit, Navy Test & Evaluation Modeling and Simulation Functional Area Support, Training Oriented Users Resource Scheduler, Cryptologic Trainers, EP-3/ES-3, EW, Command and Control Processor, COMS, Media Selection, Federal Aviation Administration, Courseware, Training Systems Requirements Analyses, Training Delivery Assessment Model, Synthetic Theater of War, "What If..." Simulation System for Advanced Research.

WEAPONS DIVISION

Weapons Systems Test and Evaluation:

AMRAAM, HARPOON, Improved Tactical Air-Launch Decoy (ITALD), JSOW, SLAM, SPARROW, Standard Missile and Tomahawk

Weapons System Integration:

EA-6B Aircraft, AH-1W Aircraft, F-14 Aircraft, F/A-18 Aircraft.

Weapons System:

Evolved Sea Sparrow (ESSM), Gator, HARM, HARPOON, HELLFIRE, JDAM, Phoenix, SLAM ER, Rolling Airframe Missile (RAM), Sidewinder, Tomahawk, Penguin.

Electronic Warfare and Information Warfare Systems:

AN/AAR-47 Warning System, AN/ALE-29, 39, 47 and 50 Countermeasures Systems, AN/ALR-66 Warning System, Weapons support systems.

CURRENT IMPORTANT PROGRAMS (continued)

Other:

Crew systems, Aircraft Launch and Recovery Systems; Electronics Manufacturing Production, materials research, Support Vessel Tracking System, Propulsion/materials exploratory and advanced development product support, Targets and simulators for air-launched systems, Threat stimulator development; Operation of land and sea ranges.

EQUIPMENT/FACILITIES**EAST AREA COMMAND**

AIRCRAFT DIVISION

Patuxent River Station, MD:

Facilities include: Chesapeake Test Range, Manned Flight Simulator, Air Combat Environmental Test and Evaluation Facility (ACETEF), Antenna and Avionics Test Facility, Electronics Systems Test Facility, Landing Systems Test Facility, Catapult and Arresting Facility, Ship Ground Station, RDT&E hangars, aircraft maintenance facilities, catapult launch system, landing systems test facility, automatic carrier landing system, marine air traffic control, range EW and flight radar cross-section facility, aircraft electrical and environmental evaluation facility, helo-ship data link evaluation facility, EW integrated systems test lab, anechoic chamber, electromagnetic environmental effects facility, EW closed loop facility, target support facility.

Warminster, PA:

Facilities include: VP/VS and Lamps Facilities, carrier ASW module lab, ASW engineering lab, vertical flight lab, air common acoustic processor lab, ASW mission planning lab, TACAIR combat training systems facility, TACAIR mission planning and systems development facilities, systems integration lab, sonar development simulation facility, dynamic flight simulator, vertical decelerator, ejection seat tower, environmental physiology lab, Navy standard signal processor lab, and open water test facility. Facilities at Warminster are/will close or be moved in 1996-97 consistent with directed base closure actions. Consult with Commander, Aircraft Division for specifics.

Trenton, NJ:

Facilities include: large and small engine altitude test area, large engine sealevel test cells, rotor spin facility, fuel and lubricants facility, helicopter transmission test facility. Facilities at Trenton are/will close or be moved in 1997-98 consistent with directed base closure actions. Consult with Commander, Aircraft Division for specifics.

Lakehurst, NJ:

Facilities include: TC13 MOD 0 and TC 13 MOD 2 Steam Catapult; MK-7 MOD 2 and MK-7 MOD 3 arresting gear; 12,000 ft test runway dedicated to aircraft launch and recovery equipment development; elevated fixed platform with installed Recovery, Assist, Securing and Traversing (RAST) system; three (3) active jet car test tracks; jet blast deflector site; support equipment test course and Universal Lighting Pad (UPL).

EQUIPMENT/FACILITIES (continued)**Indianapolis, IN:**

Computer Aided Design (CAD) equipment, Computer Aided Manufacturing (CAM) equipment, digital avionics simulation laboratory, mobile navigation/communication lab, mission planning center, integrated avionics lab, ASW lab, microwave integrated circuits lab, EP-3/ES-3 integrated test facility, meteorological satellite recovery systems lab, microwave test range, design/development environmental test equipment, engineering design lab, materials lab, stereo lithography equipment, failure analysis equipment, scanning electron microscopes, model analysis equipment. Facilities at Indianapolis were privatized in January 1997. Consult with Commander, Aircraft Division for specifics.

TRAINING SYSTEMS DIVISION

The Naval Air Warfare Center Training Systems Division's Orlando, Florida facilities consist of a three building complex located on 40.5 acres of Navy owned land in the Central Florida Research Park, adjacent to the University of Central Florida. This modern complex is the result of a \$23.5M FY85 Navy MILCON project that the organization occupied in mid-1988. The facility totals 297,480 square feet of office and laboratory space, cafeteria, conference and meeting rooms, a high bay area, and HVAC/mechanical complex along with several acres of paved parking. In addition, NAWCTSD occupies approximately 203,000 square feet of administrative and storage space as a tenant elsewhere in the Orlando Navy complex and nationwide at the 43 field site locations.

WEAPONS DIVISION

MISSILE ENGAGEMENT SIMULATION ARENA (MESA): MESA is used by all services to evaluate and verify interactions between air vehicle targets and missile sensors for determination of missile lethality, air-vehicle survivability, measurement of end-game properties, and development of new anti-air weapons to meet evolving threats.

MISSILE AND AIRCRAFT WEAPON SOFTWARE SUPPORT ACTIVITIES (WSSA): NAWCWPNS uses specially equipped laboratories to support weapon system integration and independent software verification and validation and performance testing and provides the unique capability to integrate weapon systems to platforms at a single site.

EXPLOSIVES & PROPULSION LABORATORIES: A complex of laboratories provides facilities for research in the fundamentals of propellant and explosives technology.

FULL-SCALE SURVIABILITY & VULNERABILITY FACILITY: This facility provides the capability to test and evaluate the vulnerability and lethality of air systems through full-scale, live-fire testing and computer simulations.

FUZE AND SENSORS LAB: Provides consolidated engineering laboratory space for air-to-air, air-to-surface, and surface-to-air, and fuze and sensor research, development, test and evaluation in direct support of NAWCWPNS Assigned Programs.

RADAR CROSS-SECTION MEASUREMENT FACILITY: The Junction Ranch Radar Cross-Section Measurement facility is used to measure radar-cross sections of low-observable vehicles.

EQUIPMENT/FACILITIES (continued)

INFORMATION & ELECTRONIC WARFARE (I&EW) SYSTEMS LABORATORIES: The various NAWCWPNS I&EW systems laboratories provide life-cycle support for airborne EW systems, including warning receiver, jammer, EO/IR, missile-warning, countermeasures, and support systems; software support for the EA-6B aircraft as well as for prime multiplatform EW systems; and system engineering support, including system design and integration, development of information systems, and fleet system software upgrades for warning, jamming, and decoy systems.

ELECTRONIC COMBAT RANGE CAPABILITIES: At the Electronic Combat Range NAWCWPNS provides a free-space laboratory for engineering support, testing, analysis, training, and development of systems and technologies that counter or penetrate air defenses. These capabilities are essential to full-spectrum EW system testing.

HARDWARE-IN-THE-LOOP SIMULATIONS: Extensive simulation capabilities supporting weapons design and development include six-degree-of-freedom (6 DOF) hardware-in-the-loop (HWIL) facilities.

AIR WARFARE EVALUATION FACILITY: A 121,000 sq. ft. missile system evaluation laboratory which can perform secure missile-in-the-loop seeker-performance testing under simulated operational conditions and against high-fidelity target presentations.

MISSILE & AIRCRAFT SOFTWARE VALIDATION & TESTING LABORATORIES: Laboratories are available to support independent software verification, validation and performance testing.

WEAPON SYSTEM INSTRUMENTATION & DATA ANALYSIS: These facilities support instrumentation requirements related to tactical missile, aircraft, and other product testing areas. The data analysis laboratories provide near-real-time data extraction and valuation for timely assessment of aircraft/weapon integration and missile system performance.

RANGE CAPABILITIES: The air, land, and sea ranges and test facilities contain 1,700 square miles of dedicated land, underlying more than 17,000 square miles of restricted air space, and 36,000 square miles of sea test range with overlying air space.

OTHER SPECIAL CAPABILITIES: Specialized facilities are used for electronics research leading to complete life-cycle support of fire-control systems, guidance-and-control systems for missile weaponry, sensors, and fuzes. In addition, NAWCWPNS has unique capabilities provided by its EO/IR laboratories, anechoic chambers, strategic-systems propulsion test facilities, complete photographic laboratory, and a large industrial machine shop.

Naval Air Warfare Center
Arlington, VA 22243
(703) 604-6033

Commander: VADM John A. Lockard
Deputy Commander: Dr. Alan Somoroff

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	3.530	N/A	3.530
6.1 Other	1.165	1.932	3.097
6.2	30.178	43.183	73.361
6.3	68.983	34.784	103.767
Subtotal (S&T)	103.856	79.899	183.755
6.4	132.081	325.776	457.857
6.5	155.057	121.658	276.715
6.6	101.303	129.367	230.670
6.7	80.627	54.863	135.490
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	572.924	711.563	1,284.487
Procurement	322.591	1,145.890	1,468.481
Operations & Maintenance	328.633	457.563	786.196
Other	302.143	358.112	660.255
TOTAL FUNDING	1,526.291	2,673.128	4,199.419

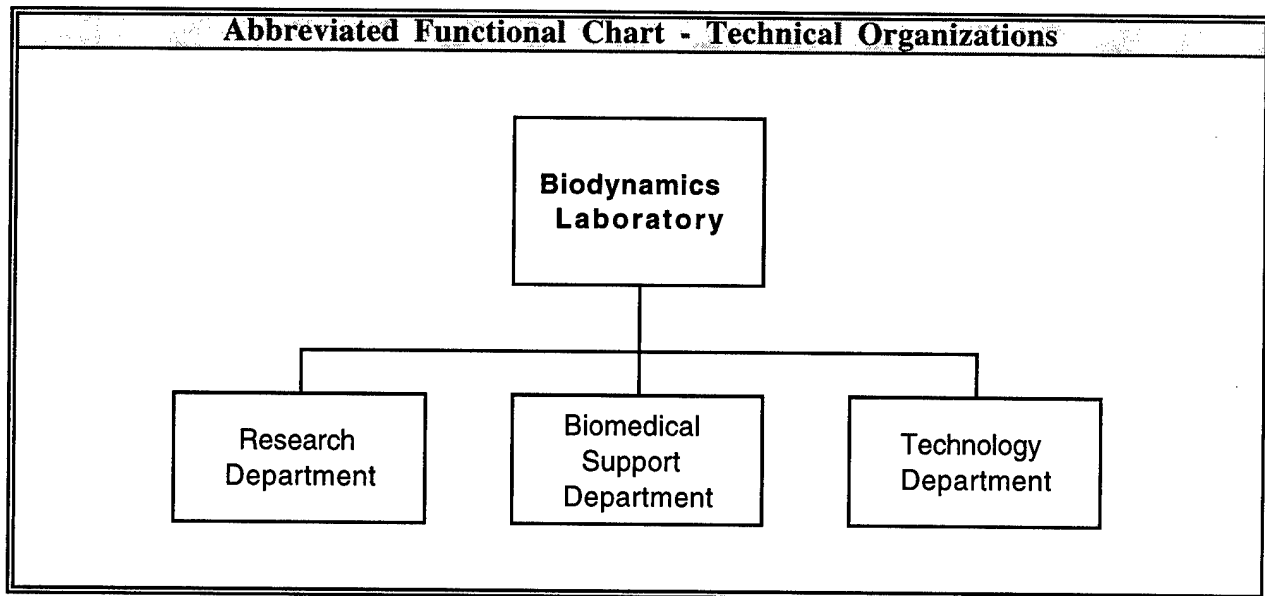
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	80.784

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	1	208	2,811	3,020
CIVILIAN	241	6,306	10,768	17,315
TOTAL	242	6,514	13,579	20,335

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	7,410.937	REAL PROPERTY	1,328.399
ADMIN	3,277.501	* NEW CAPITAL EQUIPMENT	61.035
OTHER	16,002.848	EQUIPMENT	1,057.495
TOTAL	26,691.286	* NEW SCIENTIFIC & ENG. EQUIP.	39.875
ACRES	1,153,915	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Biodynamics Laboratory



Naval Biodynamics Laboratory
New Orleans, LA 70189-0407
(504) 257-3947

Commander: CDR D. Dolgin
Chief Scientist: Dr. Marc Weiss

MISSION

To be the principal Navy activity for biomedical research on the effects of mechanical forces (motion, vibration, and impact) encountered in ships and aircraft on naval personnel; to establish human tolerance limits for these forces; and to develop preventive and therapeutic methods to protect personnel from the deleterious effects of such forces. **This mission will end due to laboratory closure on 30 September 1996.**

CURRENT IMPORTANT PROGRAMS

Determination of Human Dynamic, Injury and Performance Response to Impact Acceleration.

Development of Validated Manikin Components.

Protection of Naval Personnel from Adverse Effects of Ship Motion.

EQUIPMENT/FACILITIES

The Naval Biodynamics Laboratory (NBDL) is one of the eight laboratories under the Naval Medical Research and Development Command, headquartered in Bethesda, Maryland. NBDL is the primary Navy command conducting biomedical research on the effects of mechanical forces, establishing human tolerance limits to these forces and developing approaches to minimize their adverse effects. NBDL has several unique man-rated test devices which include:

HORIZONTAL ACCELERATOR

A nitrogen powered horizontal accelerator capable of delivering 225,000 lbs of thrust propelling a payload along a 200 meter indoor track.

Max. acceleration	140g.
Max. payload	5000lbs.
Max. velocity	150 ft./sec.
Power stroke	9.84 ft.
Pulse shape	half-sine, modified square trapezoidal
Pulse duration	.200 sec.
Track length	700 ft.
Sled dimensions	12 ft. x 4 ft.
Data acquisition	16 channel FM (telemetry), 28 channel digital

EQUIPMENT/FACILITIES (continued)**VERTICAL ACCELERATOR**

A nitrogen powered vertical accelerator capable of delivering 40,000 lbs of thrust with a 13 meter maximum range.

Max. acceleration	75g.
Max. payload	1500 lbs.
Max. velocity	65 ft./sec.
Power stroke	3.5 ft.
Pulse shape	half-sine, triangular trapezoidal
Pulse duration	.200 sec.
Height	36 ft.
Carriage dim.	2.5 ft. x 6 ft.
Data acquisition	16 channel FM (telemetry), 28 channel digital

SHIP MOTION SIMULATOR

The Navy's only ship motion simulator capable of simulating ship motions with three degrees of freedom.

Degrees of freedom	3 (heave/pitch/roll)
Heave stroke length	22 ft.
Heave freq. response	0.04 to 4.0 Hz.
Angular displacement	30 degrees (pitch and roll)
Angular velocity	25 degrees/sec (pitch and roll)

TRI-AXIAL TILT ROTATION CHAIR

A three axis tilting/rotating motion chair.

Rotation: Variable up to 20 RPM, clockwise or counter-clockwise
Pitch and roll: Total range of 80 degrees (+/- 40 deg)

ELECTRO-HYDRAULIC SHAKER

A vertical electrohydraulic shaker with a 500 pound, +/- 15 centimeter stroke capacity.

Frequency response	1 to 500 Hz
Stroke length	12 in
Payload capacity	500 lbs

These facilities will transfer ownership to the University of New Orleans 30 September 1996.

Naval Biodynamics Laboratory
New Orleans, LA 70189-0407
(504) 257-3947

Commander: CDR D. Dolgin
Chief Scientist: Dr. Marc Weiss

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.317	0.000	0.317
Subtotal (S&T)	0.317	0.000	0.317
6.4	0.891	0.000	0.891
6.5	0.000	0.000	0.000
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	1.208	0.000	1.208
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	0.000	0.000	0.000
TOTAL FUNDING	1.208	0.000	1.208

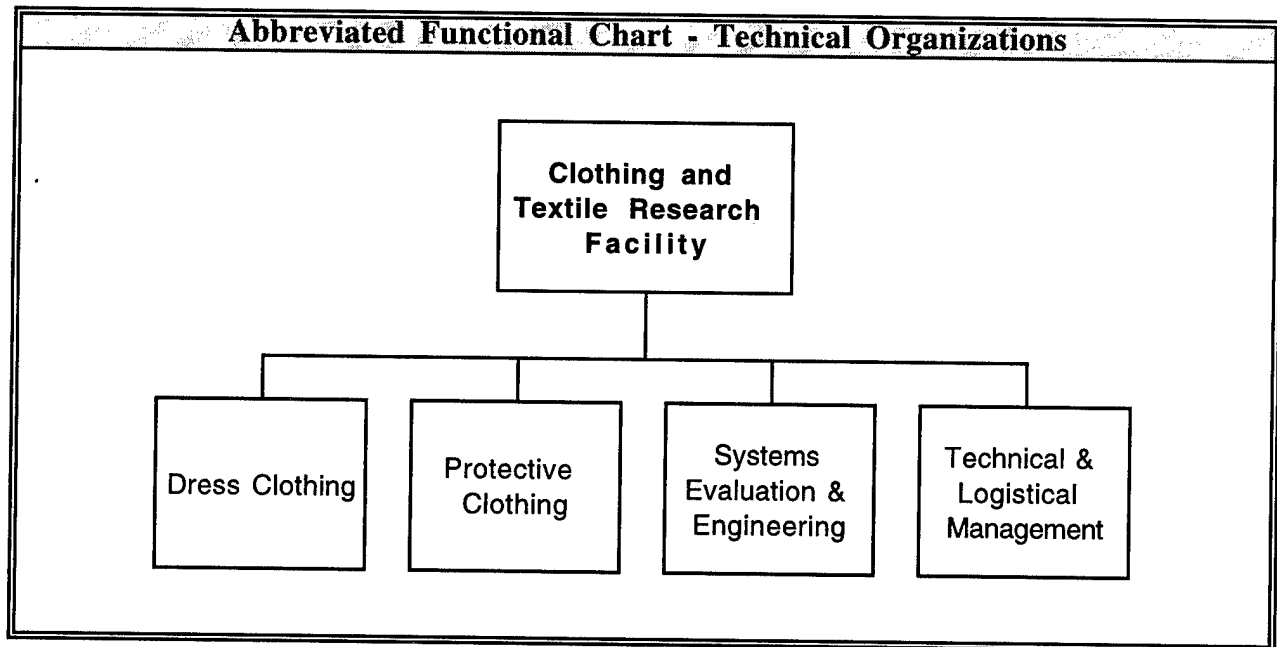
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	1	0	3	4
CIVILIAN	2	3	9	14
TOTAL	3	3	12	18

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	25.845	REAL PROPERTY	2.263
ADMIN	27.907	* NEW CAPITAL EQUIPMENT	0.000
OTHER	0.000	EQUIPMENT	4.727
TOTAL	53.752	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	2	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Navy Clothing and Textile Research Facility



Navy Clothing and Textile Research Facility
Natick, MA 01760-0001
(508) 233-4172

Commander: CDR K. T. Adams
Technical Dir: Barbara A. Avellini, Ph.D.

MISSION

Conduct research, development, test and evaluation and provide engineering support in clothing, textiles, and related fields associated with service clothing and environmental protective clothing.

CURRENT IMPORTANT PROGRAMS

1. Joint Services Lightweight Integrated Suit Technology (JSLIST) which is a joint service program to develop a garment which will be protective in chemical-biological contaminated environments and can be used in one form or another by all services.
2. Non-Development Items Program is designed to provide state-of-the art, commercially available, firefighter's protective clothing, flame resistant utility uniforms, anti-exposure suits, cold and wet weather ensembles and life-support systems and equipment for Navy personnel which meet appropriate performance requirements for the shipboard environment. Performance requirements/testing procedures are developed at NCTRF to enable commercial products to be qualified through NCTRF laboratory testing and Fleet evaluation. Testing includes conformance to standards and Navy unique requirements designed to analyze the protective capabilities of materials and clothing.
3. Electrochemical Compressor - New technology to power a personal microclimate cooling system which will result in lower weight and more efficient cooling capacity.
4. Phase Change Materials - New technology which will be used to extend the range of comfort for individuals exposed to warm and cold environments, as well as to enhance the performance of protective clothing. This technology can also be useful to the private sector.
5. A CRADA has been established between NCTRF and Battelle, Natick Operations for the purpose of furthering technologies of mutual interest for utilization in protective clothing and equipment.

EQUIPMENT/FACILITIES

A thermal manikin system is used to measure insulation values of protective clothing in both an air and a water immersion environment. This is one of only four known manikins worldwide capable of being used in both water and air; the thermal hand and thermal foot are used to measure insulation values of handwear and footwear, respectively. Worldwide, there are only three other known thermal hands and one other known thermal foot; the environmental test chamber reproduces extremes from -40°F to 130°F at 5% to 95% relative humidity, with wind speeds up to 25 mph. The hydro-environmental simulator is the only known chamber within the Navy that is able to independently control both air and water temperatures simultaneously, and thus simulate any air/water interface. A Gerber Micromark/Silhouette computer-aided design system to grade, alter, and trace patterns, and to cut hard patterns; a shipboard laundry laboratory; a thermal flammability laboratory; physiological test and evaluation equipment. Instron testers, weatherometers, fadeometers, launderometer, tear tester, etc., used to determine the physical characteristics of clothing and textiles. A traversing thermocouple instrumented manikin, used to evaluate fire resistant protective clothing at variable heat flux levels and exposure times, when exposed to a propane-fueled fire in an enclosed area.

Navy Clothing and Textile Research Facility

Natick, MA 01760-0001

(508) 233-4172

Commander: CDR K. T. Adams

Technical Dir: Barbara A. Avellini, Ph.D.

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.418	0.626	1.044
6.3	0.380	0.360	0.740
Subtotal (S&T)	0.798	0.986	1.784
6.4	0.620	0.284	0.904
6.5	0.031	0.002	0.033
6.6	0.002	0.000	0.002
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	1.451	1.272	2.723
Procurement	0.000	0.000	0.000
Operations & Maintenance	1.637	2.283	3.920
Other	0.000	0.000	0.000
TOTAL FUNDING	3.088	3.555	6.643

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	1.350

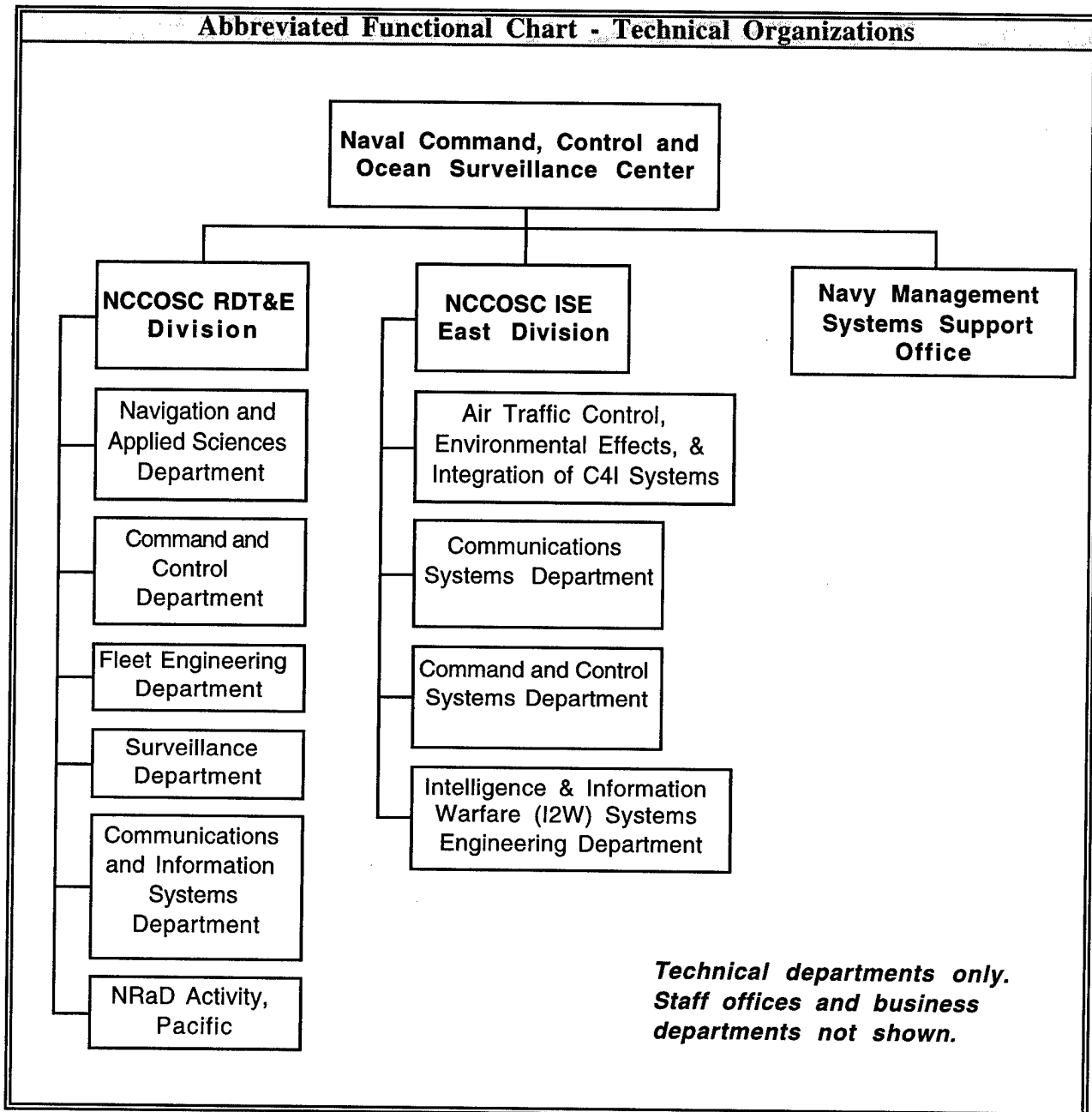
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	1	0	1
CIVILIAN	1	32	14	47
TOTAL	1	33	14	48

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	12.667	REAL PROPERTY	9.078
ADMIN	16.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	5.630	EQUIPMENT	2.111
TOTAL	34.297	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Naval Command, Control and Ocean Surveillance Center



Naval Command, Control and Ocean Surveillance Center

San Diego, CA 92147-5088
(619) 553-9740

Commander: CAPT Anthony W. Lengerich
Tech. Director: Paul Wessel

MISSION

To be the Navy's full spectrum research, development, test and evaluation, engineering and fleet support center for command, control and communications systems and ocean surveillance and the integration of those systems which overarch multiplatforms. Leadership areas: Command, Control and Communication Systems; Command, Control and Communication Systems Countermeasures; Ocean Surveillance Systems; Command, Control and Communication Modeling and Analysis; Ocean Engineering; Navigation Support; Marine Mammals; Integration of Space Communication and Surveillance Systems.

CURRENT IMPORTANT PROGRAMS

Global Command and Control System
Global Positioning System
In-Service Engineering/Fleet Support
Joint Maritime Command Information System
Joint Tactical Information Distribution System
Link 16/Link11
Multifunction Information Distribution System
SHF/EHF/UHF Satellite Communications
Submarine Communications
Tactical Receive Equipment (TRE)/TRE Related Applications
Theater Missile Defense
Air Traffic Control (ATC), Environmental Effects, Integrated C4I Systems
ATC Control and Surveillance Facilities
T-AGS 60 Class Project
Navy Tactical Command System-Afloat
Fixed Surveillance Systems
Communications Systems
Command and Control Systems
C4I systems including Tactical Support Center/TSC Communications,
Mobile-Miniature Operations Control Center (MOCC),
Naval Modular Automated Communications Systems (NAVMACS II ASHORE),
Universal Protocol Translator (UPT), Maritime Air Operations Center (MAOC),
Data Link System (LINK-11), Tactical Combat Operations (TCO),
Royal Saudi Naval Forces (RSNF), Electronic Visual Systems (EVS),
Naval Satellite Control Station (NSCS) Interface Unit (NIU),
OSIS Baseline Upgrade (OBU)
Modular maintenance systems including Strategic Systems Programs (SSP),
Marine Corps Security, and depot level repair and manufacture of C4I systems.
Joint Information systems including JIATF, USMC, JMCIS, MSC Command and Control,
High Frequency Management System (HFMS), Navy Tactical Command Systems
Afloat (NTCS-A), Contingency Theatre Air Planning Systems (CTAPS),
Operations Support System (OSS), Naval Tactical Command Support System (NTCS-A),
Relocatable Over The Horizon Radar (ROTHR), Ship Automated Communications
and Control System (SACCS).
Intelligence and Information Warfare Systems.
INFOSEC engineering design guidance, certification and testing of systems
under development, such as EIP, AMODSM, SOVR, and Electronic Key Management
System (EMKS) Tier 1 and 2 systems.

CURRENT IMPORTANT PROGRAMS (continued)

Imagery support for JMCIS and GCCS initiatives.

Technology Transfers, RDT&E Division (no personnel currently assigned to firms or institutions):

Company:	Title/Work Being Done:
Bien Logic	Planet Earth - Next Generation Home Page
Conductus	Hybrid Thin Film CMOS/Supeconducting Circuits
Environmental Tech Group	Potentiometric Scanning
Grumman	Naval Simulation Systems (NSS) Cooperative Development
HI Space Center	Excimer Laser Materials Processing
Lockheed Sanders	Undersea Acoustics & Multi-Mode Source Technology
Loral	HDR Ship to Ship & Ship to Shore Communications
LuminOre	Metal Composite Coating
Marketpath Corporation	NCCOSC RDTE DIV AHA Software Development
Optron Systems	SOS Display Technology
Perry Technologies	Tether Development Project
Proxima	UTSOS for Display Applications
RF Microsystems	Microwave CMOS Micromachined Sensors
RGB & NEOS	3-D Volumetric Display System
Spectrogram	Oil Spill Alarm System
UNISYS Govt. Sys Group	Parallelization of High Order Languages

Technology Transfers, ISE East Coast Division (2 personnel currently assigned):

Company:	Title/Work Being Done:
Scientific Research Corporation	Explore Development of a Set of Modular Automation Hardware and Software Components

EQUIPMENT/FACILITIES

Surveillance Test and Integration Center (STIC), an RFI-shielded vault that can receive and process data from various sources through on-line communications.

Southern California communications networking test range that maintains and controls sites at Pt. Mugu, San Nicolas Island, San Clemente Island, Seal Beach, and NRaD, SD, for use in multforce communications testing and support of west coast fleet exercises.

USS Dolphin (AGSS 555), a unit of Submarine Development Group One, used for research and development of advanced sonar equipment and systems.

High Performance Computing Laboratories providing a wide range of advanced computer systems for the scientific investigation of next-generation architectures.

Microelectronics Laboratory for the manufacture of products unavailable commercially.

Research, Evaluation and Systems Analysis (RESA) facility: a large-scale computer-based simulation/wargaming system used to support a variety of applications including C3I architecture assessment, concept of operations development, advanced technology evaluation, joint exercises, and test and evaluation of advanced systems.

EQUIPMENT/FACILITIES (continued)

Ship Antenna Model Range includes ground planes, model ships, track, towers, control systems, test equipment, and data reduction computers allowing simulation and modeling of ship communications.

Simulated Ships Motion Facility (SCORSBY): large ship motion simulators with the capacity to accommodate navigation systems weighing up to 3,000 lbs. Designed to apply controlled roll, pitch, and heading motions to new technology navigation systems.

Tactical Systems Support Complex: a Sensitive Compartmented Information facility supporting electronic support measures systems.

Outboard Calibration Facility: the only West Coast signal generation site designed to provide controlled stimulus to calibrate direction finding capability on OUTBOARD ships.

Cryptographic Repair Facility supports all Navy cryptographic equipment worldwide.

Radioactive Detection Indication and Calibration (RADIAC) equipment repair and calibration lab.

Fleet Maintenance Agent TSTP Lab providing in-service maintenance engineering, design analysis, and evaluation of satellite navigation systems, automated communications equipment, and message processing distribution systems.

E3: Simulation and test laboratories to support EMC, EMI, and RADHAZ efforts. MIL-STD 461D test enclosure for development of test procedures and applications to directly support the analysis and resolution of fleet EMI problems.

ESS TOWER: Tower for test and evaluation of electronic surveillance sensors.

RF COMMUNICATIONS TOWER: Provides air traffic control communications capabilities.

ENGINEERING/LAB FACILITY: Multiple use facility comprising office space, video teleconferencing laboratory and shock and vibration testing. Provides mock-up capability for integration of MISSI and other network security products such as Firewalls, Standard Mail Guards, Fortezza, etc. Provides capability for test, evaluation and integration of Navy cryptographic equipment. Also, houses a comprehensive TEMPEST test facility, NKMS deployment facility and INFOSEC ISEA capability.

INTEGRATION/LAB FACILITY: Multi-purpose facility housing project/support areas, SCIF and conference center.

RADIAC STANDARDIZATION AND CALIBRATION FACILITY: Houses an AN/UDM-1 Calibration Range using Cesium 137 source, the Navy's prime standard for gamma radiation; an AN/UDM-7 Calibrator using Plutonium 239, the Navy's prime standard for alpha radiation instrument calibration; and a MX-9335 Fast Neutron Range, the Navy's prime standard for Neutron radiation indication and computation instrument calibration. In addition to these standardization systems, this building houses a RADIAC calibration laboratory.

SHORE COMMUNICATIONS SYSTEMS CENTER: Contains operational secure communications interconnected to provide integrated systems and fleet support for Shore Secure Voice, Ship Secure Voice (Single Audio Systems) and SHF Baseband subsystems. Direct land line and on-the-air connectivity to the active Naval Communications Networks enhance Secure Voice ISEA capability by providing end-to-end system validation, remote technical assistance worldwide, development and test of field changes, and design of subsystem interface elements.

EQUIPMENT/FACILITIES (continued)

MODULE MAINTENANCE FACILITY (MMF): Serves as a third level maintenance activity for SSP. MMF comprises laboratory, shops and classroom areas. Work performed includes electronic, electrical, optical and mechanical maintenance, upgrades and ISEA support for DoD security systems. Utilized for fiber optic repair and training for arms, ammunition and explosive (AA&E).

COMMAND AND CONTROL FACILITY: Contains systems engineering, development, test and evaluation capabilities.

AUTOMATED FUEL HANDLING (AFH) LAB: Provides software development and hardware integration for the Defense Logistics Agency's Automated Fuel Handling Equipment (AFHE) program. Facility also provides PITCO.

IW EXPLOIT SYSTEMS LBFT: LBFT/COTS/MDI support facility. Also, hardware/software development, testing, and systems integration of IW exploit systems.

COMMAND SSO AND CMS FUNCTIONS: Dual usage facility

Naval Command, Control and Ocean Surveillance Center

San Diego, CA 92147-5088

(619) 553-9740

Commander: CAPT Anthony W. Lengerich

Tech. Director: Paul Wessel

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	2.762	N/A	2.762
6.1 Other	3.116	6.127	9.243
6.2	42.239	82.072	124.311
6.3	23.370	90.855	114.225
Subtotal (S&T)	71.487	179.054	250.541
6.4	25.671	31.158	56.829
6.5	37.578	45.280	82.858
6.6	3.973	6.442	10.415
6.7	42.728	54.501	97.229
Non-DOD	0.000	0.005	0.005
TOTAL RDT&E	181.437	316.44	497.877
Procurement	128.550	388.018	516.568
Operations & Maintenance	203.870	250.035	453.905
Other	53.012	101.084	154.096
TOTAL FUNDING	566.869	1,055.577	1,622.446

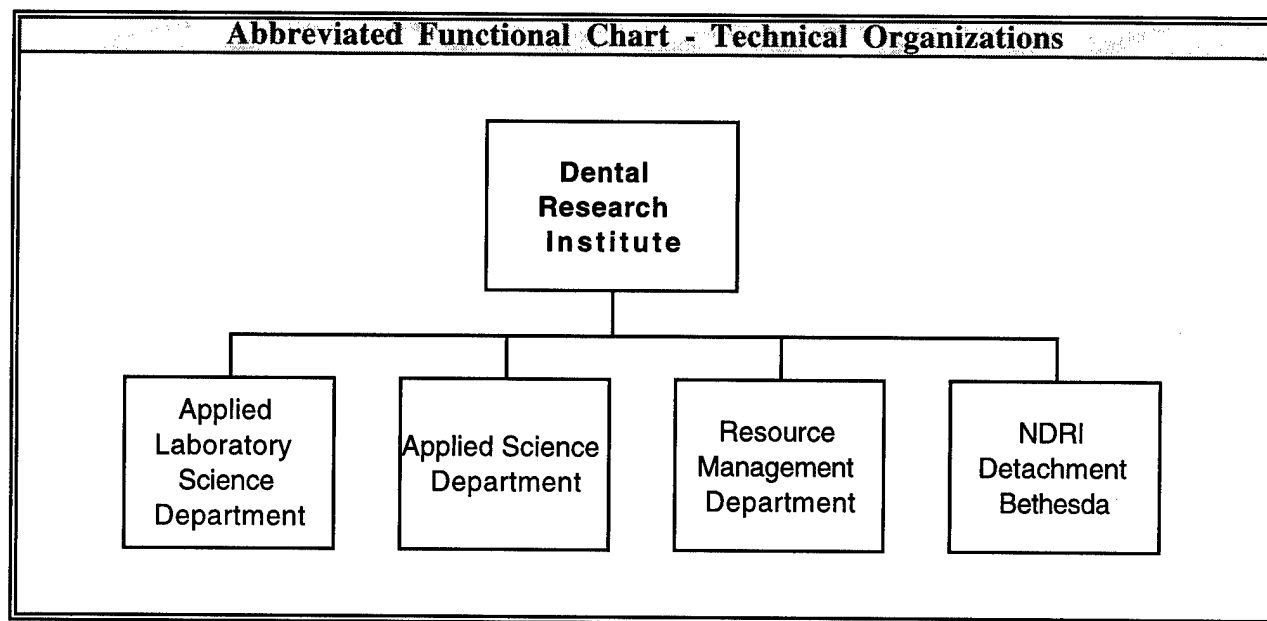
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	1.991

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	2	63	271	336
CIVILIAN	196	2,249	3,013	5,458
TOTAL	198	2,312	3,284	5,794

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	2,238.547	REAL PROPERTY	126.400
ADMIN	1,078.092	* NEW CAPITAL EQUIPMENT	0.000
OTHER	1,999.747	EQUIPMENT	209.000
TOTAL	5,316.386	* NEW SCIENTIFIC & ENG. EQUIP.	16.098
ACRES	2,799	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Dental Research Institute



Naval Dental Research Institute
Great Lakes, IL 60088-5259
(847) 688-5647

Commanding Officer: CAPT Stephen A. Ralls, DC
Chief Scientist: Dr. Lloyd G. Simonson

MISSION

To research, develop, test, and evaluate new methods and materials that limit oral disease, reduce dental emergencies, maximize operational readiness, and promote dental wellness for Navy and Marine Corps personnel.

CURRENT IMPORTANT PROGRAMS

1. Develop rapid chairside risk assessment test for dental caries (patent pending), prototypes completed with Editek, Inc.
2. Develop rapid chairside risk assessment test for oral diseases (two patents pending), prototype manufacture underway with Editek Inc. Develop use of fluorescence polarization as technique for rapid diagnosis (NDRI patent pending) with Jolley Consulting and Research Inc.
3. Develop system and apparatus to remove mercury from dental waste water (two patents pending). Industrial mercury recovery compound adapted for aqueous use with ADA Technologies, Inc.
4. Develop radiographic system to identify dental disease progression, human testing initiated.
5. Evaluate a Navy-Wide managed dental care delivery system.
6. Collect and analyze dental epidemiologic data.
7. Develop multimedia dental diagnostic and treatment system for remote site use, prototype complete.
8. Develop multimedia dental examiner calibration system.
9. Develop improved patient tracking/data collection with Smart card and optical mark recognition.
10. Develop rapid non-invasive oral assay for presence of antibodies to tuberculosis and other infectious diseases.

EQUIPMENT/FACILITIES

44,235 square feet AAALAC-accredited animal colony.

A comprehensive dental research library, numerous volumes and journals with direct MEDLINE access.

Electron microscope capability.

Extensive computer and data processing facilities.

Direct access to large military populations and the Navy's only Recruit Training Center.

Direct access to the American Dental Association, three university dental schools, a large VA hospital, a large Naval Hospital, a major Naval Dental Center, and the headquarters of nearly 50 leading dental organizations.

A gas chromatography microbial identification system.

Numerous other state-of-the art equipment.

Direct access to the National Institute of Dental Research, National Library of Medicine, the National Institute of Standards and Technology, and National Institutes of Health (NDRI Bethesda Detachment) Atomic Absorption Analyzer.

Naval Dental Research Institute
Great Lakes, IL 60088-5259
(847) 688-5647

Commanding Officer: CAPT Stephen A. Ralls, DC
Chief Scientist: Dr. Lloyd G. Simonson

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.099	N/A	0.099
6.1 Other	0.050	0.000	0.050
6.2	0.000	0.000	0.000
6.3	0.464	0.091	0.555
Subtotal (S&T)	0.613	0.091	0.704
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	0.710	0.000	0.710
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	1.323	0.091	1.414
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	0.138	0.000	0.138
TOTAL FUNDING	1.461	0.091	1.552

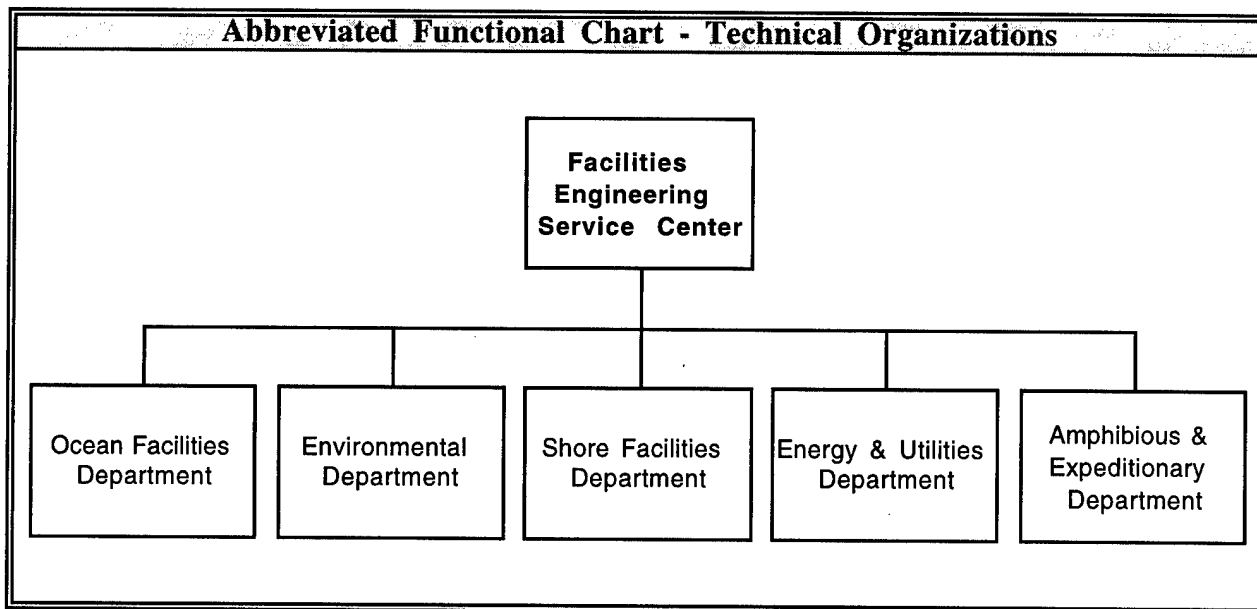
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	10	0	14	24
CIVILIAN	4	2	5	11
TOTAL	14	2	19	35

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	21.264	REAL PROPERTY	5.000
ADMIN	6.001	* NEW CAPITAL EQUIPMENT	0.000
OTHER	9.318	EQUIPMENT	2.183
TOTAL	36.583	* NEW SCIENTIFIC & ENG. EQUIP.	0.428
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Facilities Engineering Service Center



Naval Facilities Engineering Service Center

Port Hueneme, CA 93043-4328
(805) 982-1393

Commanding Officer: CAPT Donald G. Morris
Chief Engineer: Dr. Get Moy

MISSION

To provide innovative technology products and services required to improve the acquisition, operation, and maintenance of Navy Shore and Ocean Facilities and to enhance the Seabees and Marine Corps operational readiness capabilities.

CURRENT IMPORTANT PROGRAMS

Defense Environmental Restoration Program. Pollution Prevention. Navy Shore Facilities Improvement. Deep Ocean Technology in support of ASW. Marine Corps Amphibious Logistics. Navy Construction Forces System. Ocean Tests Ranges. Underwater Construction Force Systems. Explosive Safety. Physical Security Systems. Independent Exploratory Development. Independent Research. Army and Air Force support.

EQUIPMENT/FACILITIES

Deep Ocean Simulation Laboratory. Shallow Water Dive Tank. Research Motor Vessel Independence. Ballistic Test Facility for testing security products. Metallurgical Material Laboratory. Chemistry Laboratory. Water Purification Laboratory. Steamboiler Laboratory. Electromagnetic Pulse Test Facility. Environmental Protection Laboratory. Physical Security Test Facility. Soils Laboratory. Heavy Equipment Test Facility. Helo lift test site. High temperature pavements stand.

Deep Ocean Simulation Laboratory - This is the largest facility of its kind on the West Coast. It contains 12 pressure vessels capable of simulating the deep ocean environment under controlled conditions. It is used for certifying fleet hardware and support technology validation and testing. Test facilities and services are rented to the industries.

Shallow Water Dive Tank - A 30-ft diameter, 65,000 gallon seawater tank for testing oceanographic equipment, diver construction techniques, diver tools and underwater NDT equipment.

Motor Vessel *Independence* - A 200-ft vessel outfitted to support ocean engineering research and undersea equipment validation testing. The *Independence* has an internal wet well and crane system for installation and retrieval of underwater systems.

Environmental Laboratory - This facility supports the laboratory studies needing GC/MS, GC, Microtox evaluations.

High Temperature Pavements Test Facility - Controlled high temperature blast facility which simulates the jet blast of an aircraft auxiliary power unit. Used to test concrete mixtures from the effects of blasts from F-18s, B-1s and AV-8Bs.

Line/Cable Testing Facility - An 80-ft test site that applies static loads up to 200,000-lb or cyclic loads up to 100,000-lb on wire ropes, synthetic lines, and electromechanical cables.

Controlled Suspension Test Fixture - This 100-ft by 50-ft by 3-ft deep one-of-a-kind facility provides specialized survivability testing of full-sized seafloor cabling in a flowing water environment.

EQUIPMENT/FACILITIES (continued)

Seawater Test Facility - Test site for development, test and evaluation of seawater desalination equipment and expeditionary water treatment devices for production of potable water.

Cold Test Chamber - Environmental chamber for testing equipment down to -50 degrees.

Battery Laboratory - This facility was originally equipped to support testing and evaluation of batteries for the Deep Submergence Rescue Vehicle under simulated ocean conditions in conjunction with the pressure vessels of the Deep Ocean Simulation Laboratory. Large battery chargers, load banks, cell monitoring voltage scanners, and electrolyte handling equipment are used to conduct tests on silver-zinc batteries for the Navy's deep submergence vessels.

Flexor Test Stand - Computer controlled test rig capable of applying cyclical test loads of up to 300,000 lbs for dynamic barge loading tests of Flexor Pontoon connectors.

Fiber Optics Laboratory - A 2000 sq ft facility with temperature controlled cleanrooms for preparing glass optical fibers for precision optical measurements.

Geotechnical Modeling Test Facility - The only Navy facility for controlled testing involving dragging of implements through soils at metered rates for monitoring soil behavior. The facility is used for testing model anchors, site assessment tools, cable plows, and other implements for penetrating the seafloor.

Mobile Test Bed - All terrain tracked vehicle which can reach speeds of 50 mph, providing up to 50,000-lb draw bar pull, while delivering 300-hp through an auxiliary hydraulic power unit. Used for evaluating the mobility of construction and material handling equipment on various surfaces and slopes.

Naval Facilities Engineering Service Center
 Port Hueneme, CA 93043-4328
 (805) 982-1393

Commanding Officer: CAPT Donald G. Morris
 Chief Engineer: Dr. Get Moy

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.050	0.000	0.050
6.2	4.073	0.301	4.374
6.3	18.900	0.901	19.801
Subtotal (S&T)	23.023	1.202	24.225
6.4	0.080	0.100	0.180
6.5	0.104	0.004	0.108
6.6	0.461	0.000	0.461
6.7	0.000	0.000	0.000
Non-DOD	2.298	0.700	2.998
TOTAL RDT&E	25.966	2.006	27.972
Procurement	0.280	16.543	16.823
Operations & Maintenance	42.641	16.191	58.832
Other	29.324	0.599	29.923
TOTAL FUNDING	98.211	35.339	133.550

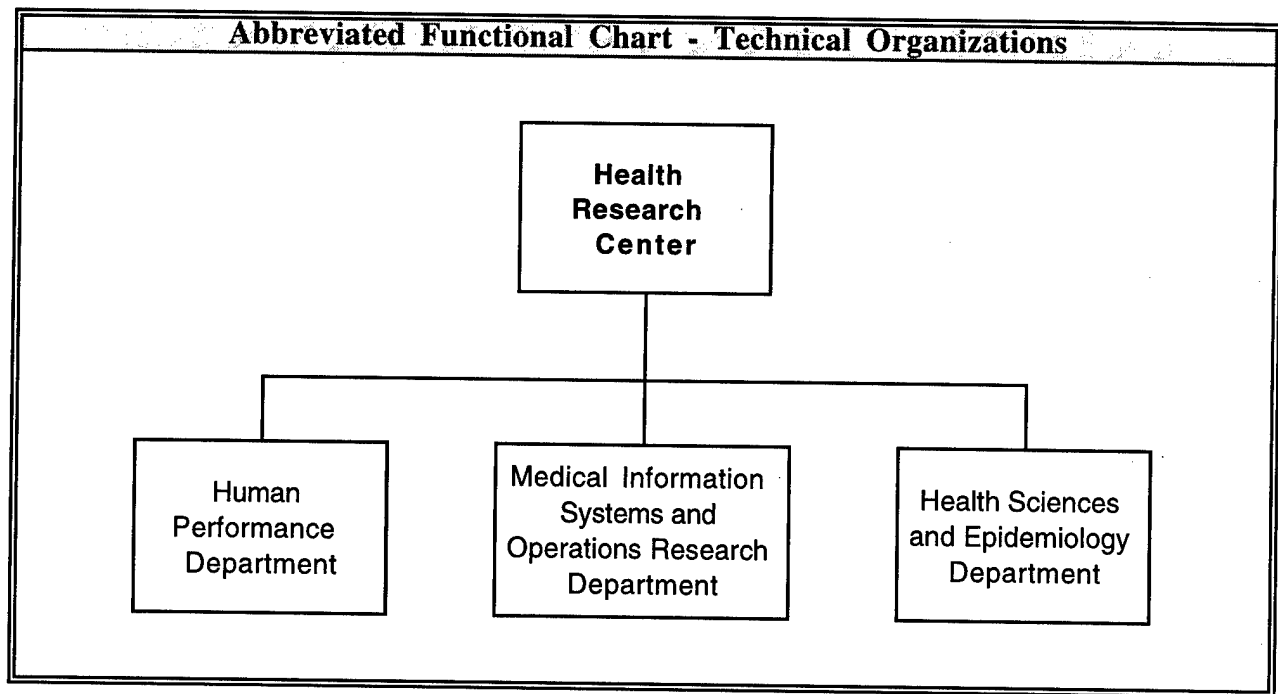
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.888

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	12	0	12
CIVILIAN	22	325	210	557
TOTAL	22	337	210	569

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	68.000	REAL PROPERTY	30.000
ADMIN	84.000	* NEW CAPITAL EQUIPMENT	0.700
OTHER	35.000	EQUIPMENT	8.700
TOTAL	187.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.700
ACRES	10	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Health Research Center



Naval Health Research Center
San Diego, CA 92186-5122
(619) 553-8400

Commanding Officer: CAPT Larry M. Dean
Scientific Dir: Dr. Don Stephen Nice

MISSION

To support fleet operational readiness through research, development, test, and evaluation on the biomedical, psychological, and physiological aspects of Navy and Marine Corps personnel health and performance; and to perform such other functions or tasks as may be directed by higher authority.

CURRENT IMPORTANT PROGRAMS

The R&D mission at Naval Health Research Center (NAVHLTHRSCHCEN) addresses three programmatic/functional areas:

1. Human Performance

- * Environmental Extremes
- * Heat Stroke
- * Physical Standards
- * Microclimate Cooling
- * Cold Weather Operations
- * Special Operations
- * Protective Equipment Evaluation
- * Alertness Monitoring
- * Circadian Rhythms Effects
- * Physiological Demands
- * Sustained Health & Performance
- * Exercise Related Injuries

2. Medical Information Systems

- * Medical Decision Making
- * Occupational Health Management
- * Theater Medical Information
- * Medical Modeling & Simulation
- * Telemedicine

3. Health Science & Epidemiology Department

- * Persian Gulf War Unexplained Illness
- * HIV Central Registry
- * Defense Women's Health Research
- * Epidemiologic Research Databases
- * Musculoskeletal Overuse Injury
- * Health Promotion
- * Alcohol Rehabilitation Program Evaluation
- * Occupational Health
- * Disease Surveillance
- * Sexually-Transmitted Disease Prevention
- * Health & Physical Readiness Evaluation

EQUIPMENT/FACILITIES**Occupational Epidemiology**

Epidemiological research focuses on HIV seroconversion, cancer, infections and chronic diseases, and injuries that affect the health of active duty Navy and USMC personnel. These studies integrate the Centers, multiple large-scale databases to describe in epidemiological term the distribution of these disorders and their possible causes.

Human Performance/Environmental Physiology Laboratory:

A unique facility with a capability readily applied to any military platform need in the Fleet. Proximity to the San Diego and West Coast fleet maximizes tech transfer into the operational forces. Capability can also be mobile and can set-up a temporary human performance laboratory anywhere in CONUS and OCONUS. Cold weather/high altitude human performance lab at USMC Mountain Warfare Training Center, Bridgeport, CA.

Equipment:

- Two environmental chambers: temperature range -20°F to 180°F; humidity 20-85%. Immersion tank: allows whole-body exposure, with temperature range of 45°F to 110°F.
- Swim flume: allows exposure to hot or cold moving water at 0 to 4 knots with temperature range of 45°F to 90°F.
- Ergonmetry equipment: Treadmills, cycles, skiing, upper body and swimming. Open-circuit spirometry metabolic measurement systems. Muscle strength and endurance computerized measurement systems.
- Biomechanics laboratory: Motion, ground reaction forces, EMG, equilibrium.
- Biochemistry laboratory: Clinical/hormonal chemistries.
- Electromyograph laboratory: EMG devices and computerized analysis equipment.
- Body composition laboratory: Anthropometric, hydrodensitometry, dual-energy x-ray absorptiometry, whole body water.
- Infrared Camera system: measures surface skin temperatures.
- Tube suit calorimeter: measures six body regions for heat flux.
- Microclimate cooling systems: gel packs, water, air, water/air combined. Performance Assessment Battery (PAB): Computerized cognitive function tests.

Biological Rhythms and Sleep Laboratory: Subjects in an isolation facility within the laboratory can be protected from exposure to outside light during sleep recordings. Sustained operations/continuous operations (SUSOPS/CONOPS) and circadian phase shifting studies are also conducted. Laboratory includes areas for cognitive testing and two sound insulated sleep room (one holding up to eight people in bunks for group studies, and a small room for one or two subjects). Four PAB stations are equipped with a variety of performance software linked in a Lantastic network allowing data from all four to be down loaded to the master unit which is equipped with an optical disk device for data storage. Controlled bright light administration is possible with the combination of a built-in light system in the PAB testing room and portable light boxes. The isolation facility also includes a treadmill for exercising subjects.

Equipment: Polysomnography: Three Beckman (SensorMedics) 8 channel polygraphs; one Nihon Kohden 12 channel polygraph; one Nicolet Sleep Wake Analyzer - 3 bed, 32 channel EEG system; 14 Medilog 9000 portable EEG recorders; 1 Medilog 9000 scanner. Evoked Potentials: 1 Neuroscan EEG data acquisition and analysis system; 1 Nicolet Compact Four, portable electrodiagnostic system. Activity Monitors: 9 Ambulatory monitoring actigraphs; 10 ambulatory monitoring Version 6.6 actigraphs; 1 actigraph interface unit with software to download actigraph data to PC.

Naval Health Research Center
San Diego, CA 92186-5122
(619) 553-8400

Commanding Officer: CAPT Larry M. Dean
Scientific Dir: Dr. Don Stephen Nice

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.090	0.094	0.184
6.2	0.583	0.744	1.327
6.3	3.229	5.276	8.505
Subtotal (S&T)	3.902	6.114	10.016
6.4	0.000	0.000	0.000
6.5	0.000	0.008	0.008
6.6	0.100	0.004	0.104
6.7	0.098	0.090	0.188
Non-DOD	0.030	0.009	0.039
TOTAL RDT&E	4.130	6.225	10.355
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.727	1.029	1.756
Other	0.000	0.000	0.000
TOTAL FUNDING	4.857	7.254	12.111

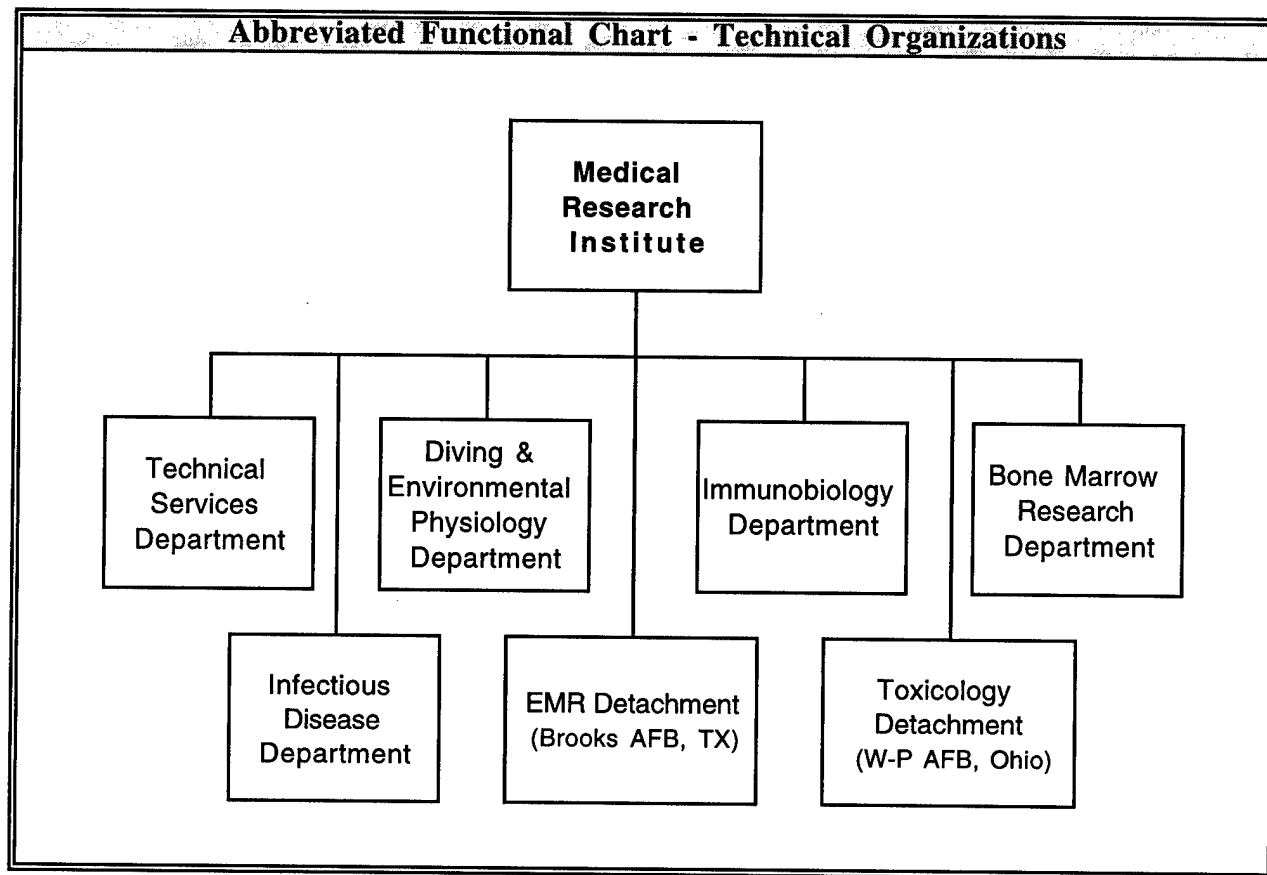
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	7	4	10	21
CIVILIAN	13	27	24	64
TOTAL	20	31	34	85

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	32.330	REAL PROPERTY	0.000
ADMIN	12.250	* NEW CAPITAL EQUIPMENT	0.000
OTHER	2.200	EQUIPMENT	1.657
TOTAL	46.780	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Medical Research Institute



Naval Medical Research Institute
Bethesda, MD 20889-5607
(301) 295-0007

Commander: CAPT Thomas J. Contreras, Jr.
Scientific Adm: CDR Richard B. Oberst

MISSION

To conduct research, development, tests and evaluations to enhance the health, safety, and readiness of Navy and Marine Corps personnel in the effective performance of peacetime and contingency missions, and to perform such other functions or tasks as may be directed by higher authority.

The specific functions to be accomplished are:

- a. Provide basic and applied research on infectious diseases, tissue transplantation, diving and hyperbaric medicine, casualty care, and environmental medicine and human factors which are directly related to military requirements and operational needs.
- b. Maintain a program of basic biomedical research in areas of military importance to develop knowledge in anticipation of future problems.
- c. Provide the scientific potential for the application of new biomedical knowledge to operational problems.
- d. Provide biomedical research capabilities to support field laboratories, hospitals and other naval activities in problems beyond their scope.
- e. Provide a source of scientific advisors and consultants readily available to operational commands.

CURRENT IMPORTANT PROGRAMS

1. Diving Medicine Program. Includes studies on the safety and mission efficiency of diving equipment and procedures (especially decompression procedures), the physiology of diving and oxygen toxicity, novel decompression methods using Hydrogen/Oxygen gas mixtures, methods to improve diver performance, and improved treatment of diving medical problems.
2. Infectious Disease Program. Includes studies on the development of vaccines, the design and development of rapid diagnostic methods, and the collection and analysis of epidemiological information on significant infectious disease threats to operating forces. Diseases studied include malaria, diarrheal diseases, dengue fever, HIV infection, hepatitis, and rickettsial diseases. Scientific expertise gained in these studies provide the basis for the deployment of field rapid diagnostic laboratories such as those deployed during Operations Desert Shield/Desert Storm and in Somalia. The laboratories were a major factor in the early diagnosis and treatment of disease in our troops, and their consequent rapid return to duty.
3. Combat Casualty Care Program. Includes studies on the enhancement of wound healing, resuscitative medicine, control of immunological system processes, methods to control and augment the formation of new blood cells, and methods for the isolation and controlled growth of blood cell precursor cells for reconstitution of the hematopoietic system, and the identification of cellular control mechanisms and development of methods for modulation of immune system activity.
4. Environmental Stress/Toxicology Program Includes studies to evaluate the significance of specific environmental factors unique to Navy operations; and to develop standards for exposure to these factors, and/or methods to improve performance of personnel required to operate in these environments. Factors include both hot and cold thermal stress, electromagnetic radiation hazards, and toxicology of numerous Navy-related chemicals.

CURRENT IMPORTANT PROGRAMS (continued)

5. DoD Marrow Donor Program, the C.W. Bill Young Marrow Donor Recruitment and Research Program : development and testing of technology for marrow rescue for individuals exposed to marrow toxic substances such as radiation or certain chemical agents. Primary research focus is rapid and accurate DNA based technology for matching between millions of volunteer potential donors and casualties or patients requiring transplants. Numerous clinical transplant technologies are under development including use of transplantable hematopoietic cells from peripheral blood. Technology development is primarily in patients who undergo therapy for underlying diseases and are treated with radiation and chemotherapeutic agents similar to chemical warfare agents.

Cooperative Research and Development Agreements

Arista - Diagnostic/ detection assays for pathogens of interest

Kara Biologics - Rapid diagnostics for pathogen detection assays

Quantech - Development of biosensors

Genelabs - Specialized work on sera of hepatitis patients

Indx - Serological testing on Dengue patients

MicroCarb, Inc.(Antex) - Large-scale production of a safe a effective vaccine for the prevention of diarrhea caused by the enteropathogenic *Campylobacter* in humans.

SmithKline Beecham Corp. - Research, development and commercialization of a genetically engineered bacterial toxin, LT-R192G, for use as a safe and efficacious mucosal adjuvant (immune enhancer) to be administered with oral vaccines.

SmithKline Beecham Corp. - Development of chimeric and humanized anti-bodies useful for the prevention of malaria.

OraVax, Inc. - Research and development of a native labile toxin and a mutant recombinant toxin as adjuvants for a *H. pylori* vaccine in humans.

Univ. of Maryland - Development and evaluation of quantitative methods to estimate the number of viable pathogens in raw food samples.

Integrated Diagnostics Inc. - Serological test for pathogens of Dengue.

Repligen Corp. - Development of recombinant proteins derived from cell surface costimulatory molecules and small molecules that will bind to these structures.

SRA Technologies, Inc. - Anti-viral cytokine discovery program.

Baxter Healthcare Corp. - Large-scale CD4 growth system.

Cellco, Inc. - Hematopoietic stem cell culture.

Vical, Inc. - Evaluation of novel vaccine approaches for prevention of malaria using genetic material encoding malarial protein antigens.

Cytel Corp. - Development and testing of recombinant constructs useful in the development of a malaria vaccine.

Agracetus, Inc. - Development of plasmid DNA-based vaccines for the prevention of malaria.

CURRENT IMPORTANT PROGRAMS (continued)

GenPharm International, Inc. - Development and testing of human monoclonal antibodies that are protective against malaria.

Entremed - Development and testing of DNA-based Plasmodium vaccines.

Swiss Serum and Vaccine Institute - Clinical testing of newly developed Cholera vaccines.

Systemix - Bone marrow stem cell expansion.

Pelargic - Real time wrist-worn decompression meter.

Organ, Inc. - Cryopreservation.

EQUIPMENT/FACILITIES

Complex of 7 buildings (1 off site) containing approximately 160,000 square feet of laboratories.

The laboratory includes the following specialized facilities or equipment:

1. Man-rated, Deep-dive Hyperbaric Research Chamber Complex: A DOD unique diving medical research chamber capable of reaching simulated depths of 300 meters, with full research quality level support systems, and composed of 5 separate, interconnected chambers, one with wet-pot capability.
2. Large Animal Hydrogen Diving Chamber: A DOD unique chamber capable of accommodating large animals and using Hydrogen/Oxygen gas mixtures. Designed for use in the study of novel enzymatic decompression techniques.
3. Emergency Hyperbaric Treatment Chamber: Special chamber designed for treatment of hyperbaric injuries or other clinical hyperbaric treatments.
4. Scanning Transmission Electron Microscope: Standard research quality instrument approximately 10 years old.
5. Fluorescence Cytometers: Three fully capable instruments, two with double laser capability, one with triple beam capability.
6. Digital Imaging System

Naval Medical Research Institute
Bethesda, MD 20889-5607
(301) 295-0007

Commander: CAPT Thomas J. Contreras, Jr.
Scientific Adm: CDR Richard B. Oberst

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.973	N/A	0.973
6.1 Other	0.754	0.225	0.979
6.2	2.253	1.160	3.413
6.3	7.113	30.233	37.346
Subtotal (S&T)	11.093	31.618	42.711
6.4	2.639	0.875	3.514
6.5	0.000	0.000	0.000
6.6	1.920	0.000	1.920
6.7	0.000	0.000	0.000
Non-DOD	0.585	0.633	1.218
TOTAL RDT&E	16.237	33.126	49.363
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.450	0.831	1.281
Other	11.815	4.140	15.955
TOTAL FUNDING	28.502	38.097	66.599

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

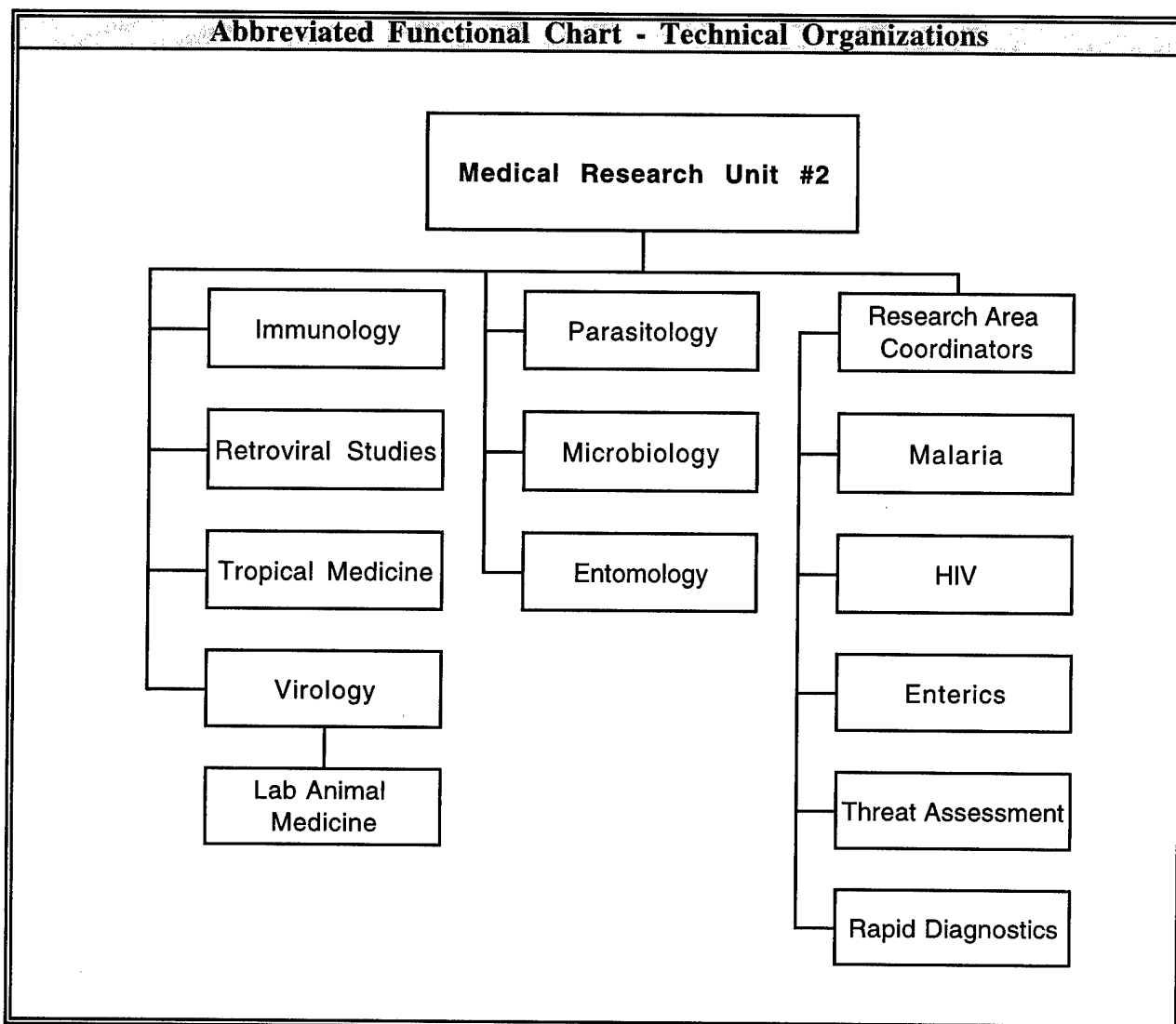
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	54	17	155	226
CIVILIAN	30	51	109	190
TOTAL	84	68	264	416

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	161.930	REAL PROPERTY	8.700
ADMIN	63.875	* NEW CAPITAL EQUIPMENT	0.550
OTHER	0.000	EQUIPMENT	22.620
TOTAL	225.805	* NEW SCIENTIFIC & ENG. EQUIP.	0.620
ACRES	7	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Naval Medical Research Unit # 2



Naval Medical Research Unit # 2

Jakarta, Indonesia, 96520-8132
(62) 421-4454

Commander: CAPT H.V. Peterson, MSC
Exec. Officer: LCDR T.R. Jones, MSC

MISSION

Conduct RDT&E in Tropical Medical and Infectious Diseases to maintain and enhance the health, safety, and readiness of Navy and Marine Corps personnel in the performance of peacetime and contingency missions in Southeast Asia and other tropical and subtropical regions.

CURRENT IMPORTANT PROGRAMS

Evaluation of new antimalarial agents or combinations of traditional antimalaria agents for the treatment and prevention of malaria in Indonesia.

Development of a malaria vaccine test site.

Development of dengue vaccine test site.

Determining the epidemiology of Hepatitis E Virus infections in Southeast Asia.

Identification of emerging infectious disease threat agents in Southeast Asia. This includes areas in Vietnam frequented by members of the Joint Task Force for Full Accounting in Vietnam, Cambodia, and Laos.

Development and evaluation of methods for the rapid identification of infectious disease threat agents such as those responsible for febrile diarrhea, sexually transmitted diseases, and AIDS.

EQUIPMENT/FACILITIES

Mosquito breeding colony for parasite vector transmission and susceptibility studies with malaria. Animal colony used in mosquito breeding, parasite studies, and for production of antigens and antibodies. Virology Department has capability of isolation and identification of human viral pathogens and also of performing serological tests for evidence of viral infections. Microbiology Department maintains a comprehensive diagnostic medical microbiology capability and in addition has sophisticated equipment and reagents required for biomolecular identification and characterization of microbial pathogens. Tropical Medicine Department utilizes a double laser flow cytometer for identification of specific white cell types by detecting specific epitopes on the white cell surface. NAMRU-2 also maintains a field laboratory in Jayapura, Irian Jaya which primarily is used to perform malaria related laboratory assays and also to process research specimens for shipment to the Jakarta lab. All departments work closely with counterparts within Indonesian laboratories and hospitals.

The transfer of the Biosafety Level 3 Laboratory to NAMRU-2 Jakarta gives this command a state-of-the-art containment facility that exceeds all current requirements for work with biosafety level 3 pathogens. This facility will allow NAMRU-2 personnel to work safely, both at the lab bench and with experimental animals, with samples from patients with hemorrhagic fever of unknown origin and such regionally important agents as Rickettsia, Japanese B Encephalitis Virus and Hantaan Virus. It will also provide the needed biocontainment for proposed field programs to survey for emerging diseases in Indonesia.

Naval Medical Research Unit # 2

Jakarta, Indonesia, 96520-8132
(62) 421-4454

Commander: CAPT. H.V. Peterson, MSC
Exec. Officer: LCDR T.R. Jones, MSC

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.100	N/A	0.100
6.1 Other	0.400	0.047	0.447
6.2	0.450	0.032	0.482
6.3	0.300	0.064	0.364
Subtotal (S&T)	1.250	0.143	1.393
6.4	0.000	0.000	0.000
6.5	0.145	0.000	0.145
6.6	1.903	0.000	1.903
6.7	0.000	0.000	0.000
Non-DOD	0.890	0.000	0.890
TOTAL RDT&E	4.188	0.143	4.331
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	1.012	0.000	1.012
TOTAL FUNDING	5.200	0.143	5.343

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

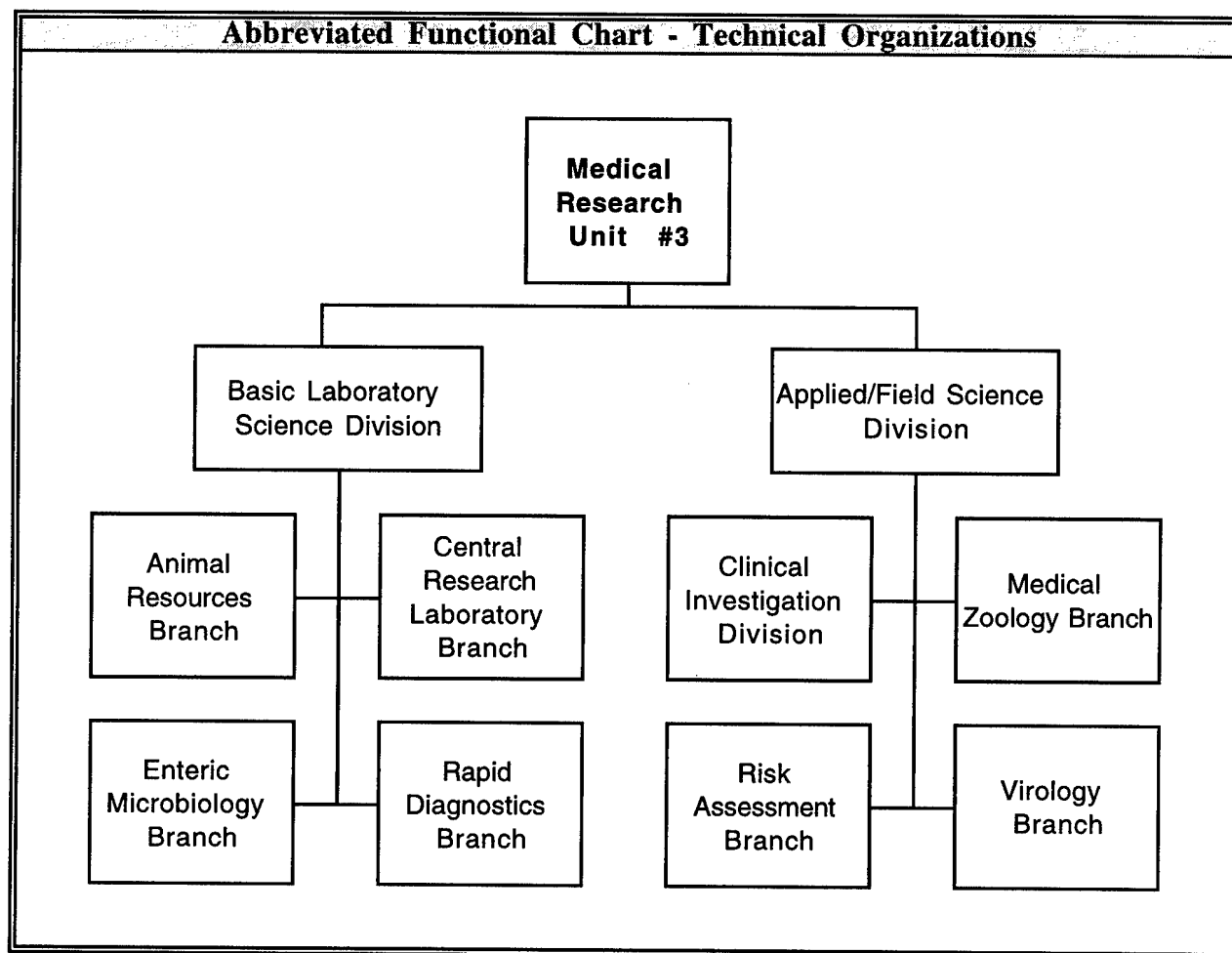
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	9	3	8	20
CIVILIAN	10	40	48	98
TOTAL	19	43	56	118

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	15.132	REAL PROPERTY	1.878
ADMIN	11.797	* NEW CAPITAL EQUIPMENT	0.000
OTHER	22.330	EQUIPMENT	1.989
TOTAL	49.259	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Naval Medical Research Unit # 3



Naval Medical Research Unit # 3

Cairo, Egypt, 09835-0007
(202) 284-1381

Commander: CAPT. Alfred J. Mateczun
Director: CDR Eileen D. Villasante

MISSION

To conduct research, development, test and evaluation to enhance the health, safety, and readiness of Department of Defense personnel assigned to Southwest Asia and Africa in the performance of peacetime and contingency missions, and to perform other such functions as may be directed by higher authority.

Conduct research programs in infectious diseases (ID) which directly relate to military medical requirements and operational needs.

Conduct interactive ID research with the Navy and other DoD medical R&D laboratories, specifically in areas of preventive medicine, epidemiology and tropical medicine.

Develop and maintain capability to provide ID risk assessment information and conduct research and development to improve prevention, diagnosis, and treatment of ID in the Fleet and Fleet Marine Force.

Maintain a technology base and scientific and technical expertise in infectious disease and tropical medicine to provide advisory assistance when requested.

Provide or undertake such other appropriate functions as may be authorized or directed.

CURRENT IMPORTANT PROGRAMS

Continuing assessment of regional infectious diseases of epidemic potential, and/or likely to hamper military operations.

Assessment of the efficacy of current drug treatment regimens to treat diseases such as schistosomiasis, diarrheal diseases and meningitis.

Determine the range of genetic variability of HIV-1 strains isolated from subjects with a wide spectrum for different risk factors for HIV infection.

Develop a field test site for phase 3 trials of enterotoxigenic E. Coli vaccine and identify the pathogenic strains of ETEC responsible for epidemics of diarrheal disease in Egypt.

Conduct phase 3 trial of enterotoxigenic E. Coli vaccine in Egyptian children and Northwest Europeans conducting Nile cruises.

Determine incidence of Rift Valley fever (RvF) in Egypt.

Characterize protective immune responses against Group B Meningococcus.

Assess the threat of Hepatitis E infections to deployed U.S. forces in Theater of Operation.

Isolate and propagate Hepatitis E virus in culture.

CURRENT IMPORTANT PROGRAMS (continued)

Determine incidence of Campylobacter strains responsible for diarrheal diseases in deployed forces in Egypt.

Continue technology base capability to rapidly identify, formulate control strategies and assess the threat of high hazard viral disease threats to military operations.

Continue tech base capability for identifying and evaluating the threat of arthropod vectors which transmit militarily important diseases.

EQUIPMENT/FACILITIES

The equipment and resources at NAMRU-3 make it competitive with any major research laboratory in the United States.

BIOMEDICAL RESEARCH SCIENCE BUILDING:

6 story state-of-the-art design completed in 1983. Clinical and Applied Research Laboratory. 2,750 Sq foot P-3 level biohazard containment. Backup emergency generators and modern ventilation and waste disposal design.

LIBRARY:

Heavily used by local scientists/physicians. Subscription to over 75 scientific journals. Houses over 7,000 reference books. Interacts with Library of Medicine (Bethesda) via CD-ROM and computer link through USAID.

SNAIL BREEDING LABORATORY:

Produces over 1 million cercariae per day.

INSECTARY:

Supports colonies of disease vectors such as ticks, mosquitoes and sandflies.

ANIMAL FACILITY:

Directed by U.S. Army Veterinarian and enlisted (91T) Veterinary Technician. State-of-the-Art Barrier Facility for breeding inbred mouse strains, rodents, geese, sheep, baboons, and etc.

PUBLIC WORKS FACILITY:

Directed by U.S.N. Civil Engineering Corps Officer. Engineering: Maintenance, construction, design, transportation (30 vehicles). Shops: Automotive, electrical, mechanical, sheet metal, carpentry, paint, and plumbing.

OTHER SUPPORT FACILITIES:

Administration, Finance, Supply, Public Works, Pharmacy, Medical Equipment Repair, Safety, Occupational Health, Computer, and Post Office.

ACCESS TO ABBASSIA FEVER HOSPITAL:

Largest MOH Infectious Disease Hospital (1,500 beds). Immediately adjacent to NAMRU-3. NAMRU-3 wards: FUO, Enteric Fever and Meningitis; Intensive Care Unit.

Naval Medical Research Unit # 3
Cairo, Egypt, 09835-0007
(202) 284-1381

Commander: CAPT. Alfred J. Mateczun
Director: CDR Eileen D. Villasante

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.100	N/A	0.100
6.1 Other	0.400	0.000	0.400
6.2	0.600	0.000	0.600
6.3	0.400	0.000	0.400
Subtotal (S&T)	1.500	0.000	1.500
6.4	0.000	0.000	0.000
6.5	0.400	0.000	0.400
6.6	2.800	0.000	2.800
6.7	0.000	0.000	0.000
Non-DOD	0.200	0.000	0.200
TOTAL RDT&E	4.900	0.000	4.900
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	0.300	0.000	0.300
TOTAL FUNDING	5.200	0.000	5.200

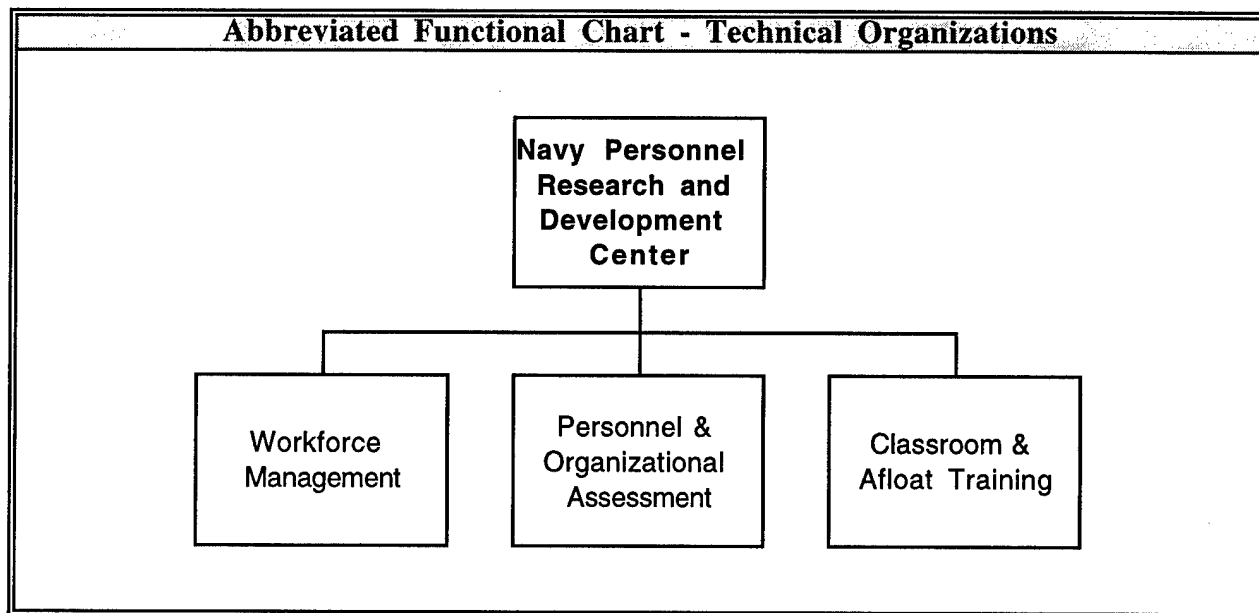
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	10	1	20	31
CIVILIAN	20	44	102	166
TOTAL	30	45	122	197

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	68.200	REAL PROPERTY	10.600
ADMIN	9.100	* NEW CAPITAL EQUIPMENT	0.000
OTHER	71.300	EQUIPMENT	4.900
TOTAL	148.600	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	4	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Navy Personnel Research and Development Center



Navy Personnel Research and Development Center
San Diego, CA 92152-7250
(619) 553-7812

CO: CAPT P. M. Spishock
Technical Dir: Mr. Murray W. Rowe

MISSION

NPRDC serves as the Navy's principal research laboratory for developing Manpower, Personnel and Training (MPT) technologies. We maintain and enhance fleet readiness by developing state-of-the-art technology solutions to significant operational problems in Workforce Management, Personnel and Organizational Assessment, and Classroom and Afloat Training. The Center's expertise also encompasses personnel surveys, multicultural and gender research, quality of life issues, productivity enhancement, and drug abuse research.

CURRENT IMPORTANT PROGRAMS

WORKFORCE MANAGEMENT - A comprehensive program to improve the Navy's management of its personnel resources. Products include suites of integrated, computer-based models, databases and systems which enable: Rapidly collecting and displaying information on personnel force characteristics in easily understood graphic and tabular forms; Testing the effects of alternative policies on the workforce by mathematically simulating force dynamics under varying test policies; Developing and updating manning plans to reflect budgetary and end-strength constraints, and statistically forecasting losses and gains at several levels of detail within the enlisted and officer workforce.

Major projects include the Enlisted Strength Planning System, which enables monitoring all personnel force transactions on a daily basis; the Navy Training Reservation System (NTRS), designed to improve the way students are scheduled for Navy schools, while cutting times lost while students transition to and from schools; a Job Advertisement and Selection System (JASS), an on line information and decision system for both sailors and detailers; and Computer-Based Technology for Detailers, which (1) optimally matches rotating sailors to available jobs while considering moving costs, (2) meets sailors' location preferences, and (3) enables maximum use and reuse of individual skills. The department also provides R&D support for the Navy Drug and Alcohol Prevention Program, with tasks addressing detection, prevention, education and substance abuse modeling.

PERSONNEL AND ORGANIZATIONAL ASSESSMENT - The goal of the overall research program is to enhance both personnel and organizational readiness. Efforts in Personnel Assessment address enlisted and officer selection, personnel testing, job classification, and performance measurement. The Center has a strong program to improve the sensitivity and effectiveness of computer adaptive testing in general. Innovative measurement technologies, including computer-based dynamic measures, are also being explored for their usefulness in personnel assessment.

Organizational Assessment investigates and develops organizational solutions to meet Navy goals. Research projects focus on organizational and workgroup behavior. Major projects involve personnel surveys and attitude assessment, multicultural and gender integration, the role of quality of life factors in relation to readiness, and technical innovations to enhance workgroup productivity.

CLASSROOM AND AFLOAT TRAINING - A broad training and education research program that incorporates advanced instructional and computer-based training technologies to create new and better ways to teach complex warfighting skills. The goals of this program are to reduce the costs of initial skills training as well as costs of maintaining highly perishable but infrequently practiced job skills.

CURRENT IMPORTANT PROGRAMS (continued)

This broad-based research program explores the use of multimedia technologies to develop automated classrooms, applications of video teletraining to deliver training worldwide, and the use of high fidelity simulations of complex physical systems to enhance training effectiveness.

One of the major programs involves the Interactive Multisensor Analysis Trainer (IMAT), which integrates two advanced technologies (instructional methodology and computer-based graphics systems) in a unique visual and dynamic environment. IMAT is currently designed to support the very complex, multi-domain operator and tactician tasks performed in Undersea Warfare.

The system uses models, databases and algorithms to accurately generate representations of real world oceans, threat submarine propulsion systems, sensor arrays, and systems not currently centrally managed. The trainer can create a full range of visual simulations suitable to apprentice through master training by controlling the complexity and variability of the visual scene.

Instructors who previously relied on teaching through complex equations can now let the student 'see' physical interactions that previously existed only in scientific notation. The application of this technology creates a training system that is cost-effective to operate and which represents the interactions of complex variables in a more understandable format.

EQUIPMENT/FACILITIES

The Center occupies approximately 76,700 square feet of space in converted World War II barracks buildings. Much of this is configured to accommodate the social science and mathematical analysis tasks performed on microcomputers and minicomputers. The facilities include upgraded electrical capability and air conditioning of the most equipment-intensive rooms. In addition, there are two facilities which contain computer rooms with raised flooring, central air conditioning, and upgraded electrical power, both components of the Center Research Computing Facility (RCF):

One installation occupies 2000 square feet and houses an IBM 4381 mainframe computer facility. It is used to develop, process, and maintain statistical and forecasting systems; very large complex personnel and training databases, and large software system applications.

A separate Sun Systems facility, operating under the UNIX operating system occupies 1600 square feet. It provides network (internal and external) services, data analysis software, text processing support, graphics/video image processing software, and electronic mail/news services. The data analysis, text processing, and graphics/video image processing software is specialized and, in some cases, custom written for NPRDC applications. Some of the RCF services required modifications to the UNIX operating system kernel, necessitating an NPRDC source license for the UNIX operating system.

Navy Personnel Research and Development Center
 San Diego, CA 92152-7250
 (619) 553-7812

CO: CAPT P. M. Spishock
 Technical Dir: Mr. Murray W. Rowe

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.169	N/A	0.169
6.1 Other	0.021	0.022	0.043
6.2	3.026	1.193	4.219
6.3	3.010	4.987	7.997
Subtotal (S&T)	6.226	6.202	12.428
6.4	0.021	0.417	0.438
6.5	0.596	0.404	1.000
6.6	0.263	0.471	0.734
6.7	0.086	0.000	0.086
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	7.192	7.494	14.686
Procurement	0.192	0.025	0.217
Operations & Maintenance	3.975	5.008	8.983
Other	0.339	1.464	1.803
TOTAL FUNDING	11.698	13.991	25.689

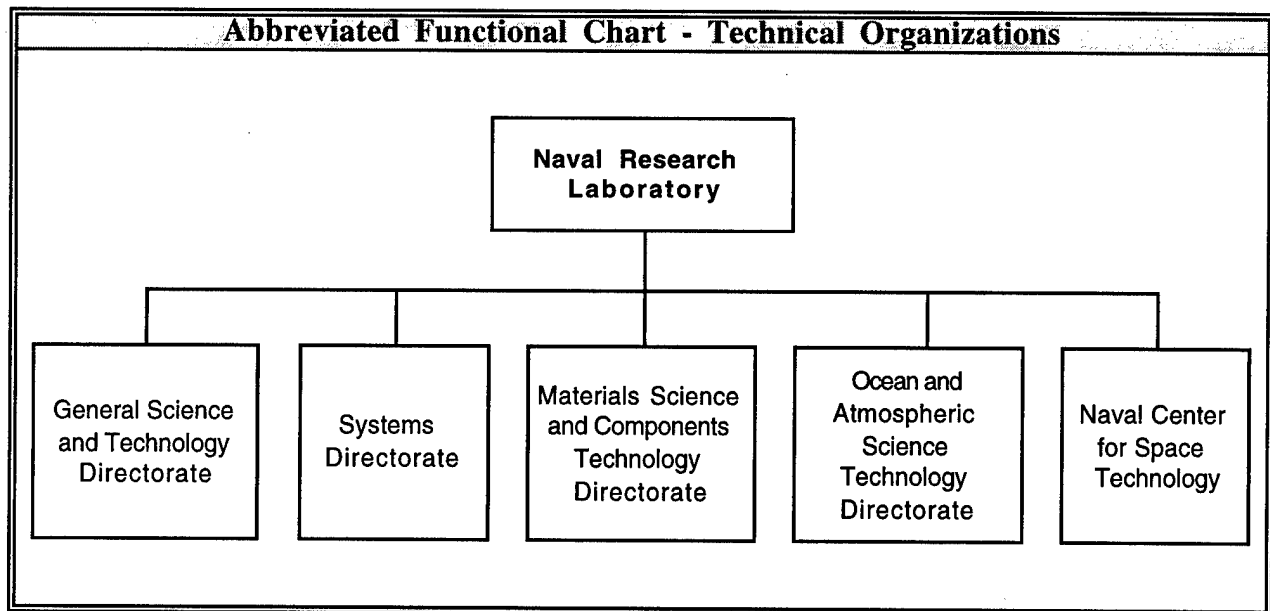
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	6	8	14
CIVILIAN	31	57	41	129
TOTAL	31	63	49	143

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	55.800	REAL PROPERTY	1.170
ADMIN	16.400	* NEW CAPITAL EQUIPMENT	0.000
OTHER	4.500	EQUIPMENT	8.659
TOTAL	76.700	* NEW SCIENTIFIC & ENG. EQUIP.	0.492
ACRES	3	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Research Laboratory



Naval Research Laboratory
Washington, D.C. 20375-5320
(202) 767-2541

Commanding Officer: CAPT Bruce W. Buckley
Dir of Research: Dr. Timothy P. Coffey

MISSION

Operate as the Navy's full spectrum corporate laboratory. To conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems and ocean, atmospheric, and space sciences and related technologies. In fulfillment of this mission, the Naval Research Laboratory:

- (1) Initiates and conducts broad scientific research of a basic and long-range nature in scientific areas of interest to the Navy.
- (2) Conducts exploratory and advanced technological development deriving from or appropriate to the scientific program areas.
- (3) Within areas of technological expertise, develops prototype systems applicable to specific projects.
- (4) Assumes responsibility as the Navy's principal R&D Activity in areas of unique professional competence upon designation from appropriate Navy or DoD authority.
- (5) Performs scientific research and development for other Navy activities and, where specifically qualified, for other agencies of the Department of Defense and, in defense-related efforts, for other Government agencies.
- (6) Serves as the lead Navy activity for space technology and space systems development and support.
- (7) Serves as the lead Navy activity for mapping, charting, and geodesy (MC&G) research and development for the National Imagery and Mapping Agency.

LEADERSHIP AREAS: NRL, the Navy's single, integrated corporate laboratory, provides the Navy with a broad foundation of in-house expertise from scientific through advanced development activity. Specific leadership responsibilities and expertise are maintained in the following areas:

- (1) Primary in-house research for the physical, engineering, space, and environmental sciences.
- (2) Broadly based exploratory and advanced development program in response to identified and anticipated Navy needs.
- (3) Broad multidisciplinary support to the Naval Warfare Centers.
- (4) Space and space systems technology, development, and support.

CURRENT IMPORTANT PROGRAMS

Low observables technology.

SPQ-9B upgrade allows detection and tracking of low flying small missiles.

Advanced Specific Emitter Identification technology for threat ID, Combat ID, and counter proliferation.

Littoral oceans and atmosphere meso/tactical scale dynamics.

Environmental remote sensing - hyperspectral, microwave and radar.

Coastal mid/high frequency acoustics.

Army Airborne Command and Control System.

Microelectronics and Photonics Test Bed (MPTB).

Electric Propulsion Demonstration Module (EPDM).

Tethered Physics and Survivability Experiment (TIPS).

Cooperative Research and Development Agreements

- Magnicon development at 11.4 Hz: OMEGA-P Incorporated
- Laser Single Event Upset Evaluation of complex Systems: Computing Devices International
- Downwell Optical Fiber Acoustic and Pressure Monitoring Systems for Oil, Gas, and Geothermal Reservoir and Well Management: CIDRA Corporation
- Virtual Environments for simulation Based Design: Lockheed Martin Corporation
- Liquid Crystal Alignment Layer Program: Shipley Company
- Technical Assistance CRADA: Mid-Atlantic Technology Applications Center
- Fabrication of Low Loss Core/Clad Fiber for 1.3 mm Amplification: Corning Inc.
- Detection of Contraband Narcotics by Nuclear Quadrupole Resonance (NQR): Quantum Magnetix.
- An Agreement to Transfer Biological Materials from SRI International to the NRL: SRI International
- Commercial Remote Sensing System Sensor Proton Irradiation: Eastman Kodak, Inc.
- Computational Approach to MIE Scattering: Rohm & Haas Company
- Development of a Hand-Held Apparatus for Automatic Allow Identification: Quantrad Sensor, Inc.
- Oligonucleotide Array Fabrication for Genetic Analysis: Molecular Tools, Inc.
- Thermal and Spectroscopic Effects: Dilute Rare Earth Crystals: Sanders, a Lockheed Martin Company

CURRENT IMPORTANT PROGRAMS (continued)

- Naval Environmental Operational Nowcasting System: Empress Software, Inc.
- Atomistic Simulations of Mesoscale Phenomena: IBM Almaden Research Center
- Quantitative Mobility Spectrum Analysis for Hall Evaluation Software Package: Lake Shore Cryotronics, Inc.
- Electronic Support Systems Technology: AIL Systems, Inc.
- Ion Beam Assisted Deposition of Ge: AIN Electron, Photon and Optoelectronic Devices: Structured Materials Industries, Inc.
- Non-Equilibrium Superconducting Tunnel Junction X-Ray Detector Development: Paul Scherrer Institut, Switzerland
- Hydrogen Maser Research: Hughes Space and communication Company
- Microtubule Based controlled Release Coatings: Biocompatibles, LTD, UK
- Investigation of Search and Retrieval Systems: American Physical Society
- Microwave Application of Thin Film Ferroelectrics Integrated with High Temperature Superconductors: Superconductor Core Technologies
- Technical Assistance CRADA: University of Maryland
- Thin Films: IBM Corporation T.J. Watson Research Center

EQUIPMENT/FACILITIES

- High Performance Computation and Communication Facility: 2 TMC CM-500e's (256 node, 40 GFLOP peak, 32 Gbytes RAM; 32 node, 4 Gbytes RAM). GSI origin 2000 (64 nodes, 25 GFLOPS peak, 12 Gbytes RAM); Hewlett-Packard/Convex SPP-2000 (64 nodes, 46 GFLOP, 16 Gbytes RAM). The facility has 400 Gbytes of disc and 43 Tbytes of tertiary storage. Extensive graphics and visualization facilities are also available. The facility has ATM networks at 155 Mbps and 622 Mbps, and a regional ATM network ATDnet operating at 2.5 Gbits/Sec.
- Central Target Simulation Facility: The CTS facility is a high performance, hardware-in-the-loop simulator used for real-time test and characterization of advanced technology electronic warfare systems and techniques being developed to counter missile threats to Navy platforms.
- NRL IR Range: A unique DoD facility capable of characterizing the infrared signature of new coatings, components and scale models at target altitudes ranging from sea level to 30,000 feet. The facility includes a versatile target mount with control over pitch, yaw, temperature and position. Targets can be viewed at angles characteristic of standard threats.
- Nanoelectronics Processing Facility (NPF) and Penthouse Facility: The NPF maintains a tool base for micrometer and nanometer device and structure fabrication. There is a strong emphasis on computer-aided design and lithography utilizing an e-beam lithography system with a 10-nanometer spot size. Other processing includes reactive ion etching, deep ultra violet photolithography, ultra

EQUIPMENT/FACILITIES (continued)

clean oxidation and annealing, and polysilicon and silicon oxide deposition. The micro-assembly lab provides a full sawing, bonding and chip mounting capability. A hands-on capability for compound semiconductor processing is provided in the Penthouse Facility.

- EPI center: This facility is dedicated to molecular beam epitaxial (MBE) film growth and in-situ characterization of Group II-VI and Group III-V semiconductors. Through the use of a high vacuum sample transfer system, samples can be moved between the two growth chambers as well as two analysis chambers without exposing the semiconductor structures to atmospheric contamination. In one analysis chamber, an angle-resolved electron spectrometer is used to determine the structure and chemical identity of the epitaxial layers near the film surface. In the second chamber, a scanning tunneling/atomic force microscope is employed to determine surface morphology and near surface electronic properties of the epitaxial layers.

- Mass Spectrometry Facility: Principal research instruments include a Finnigan TSQ-70 triple quadrupole mass spectrometer equipped with particle bombardment, electrospray, atmospheric pressure chemical ionization, thermal desorption, electron ionization and chemical ionization and tandem mass spectrometry capabilities.

- Acoustic Holography Pool Facilities: Steel cylindrical tank, 50 feet deep, containing 800,000 gallons of water. Entire tank is vibration and temperature isolated and instrumented with precise measurement systems, including in-water robotic scanners capable of generating nearfield acoustic holography radiation and scattering database. This tank is complemented by its 'sister' pool, similarly instrumented but with a sandy bottom.

- Map Data Formatting Facility (MDFF): The MDFF compresses maps (65 to 1) in digital form and places the end product on a CD ROM. The library of CD ROMs is used to make mission specific optical disks for several Navy tactical aircraft AV8B, F/A-18, V-22. Each CD contains approximately 65 charts in a seamless projection. This unique development proved its worth in Operations Desert Shield and Desert Storm as well as in Somalia and other hot spots.

- Navy Prototype Optical Interferometer (NPOI): The NPOI is joint with the U.S. Naval Observatory and Lowell University. The facility makes high angular resolution optical observations of stars for astrometry and astrophysics providing essential data for earth rotation, celestial reference frame determinations, and determination of stellar masses. Initially, with telescope separations of 60 m it should detect 1 milliarcseconds (mas) structures; enhancements over the next few years (including baselines as long as 470 M) should increase the resolution to 0.1 mas.

Naval Research Laboratory
Washington, D.C. 20375-5320
(202) 767-2541

Commanding Officer: CAPT Bruce W. Buckley
Dir of Research: Dr. Timothy P. Coffey

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	76.600	19.100	95.700
6.2	78.300	78.000	156.300
6.3	78.600	111.500	190.100
Subtotal (S&T)	233.500	208.600	442.100
6.4	14.400	33.700	48.100
6.5	22.300	39.300	61.600
6.6	3.100	6.400	9.500
6.7	11.800	15.100	26.900
Non-DOD	15.900	10.000	25.900
TOTAL RDT&E	301.000	313.100	614.100
Procurement	36.400	54.900	91.300
Operations & Maintenance	12.100	26.000	38.100
Other	9.800	14.500	24.300
TOTAL FUNDING	359.300	408.500	767.800

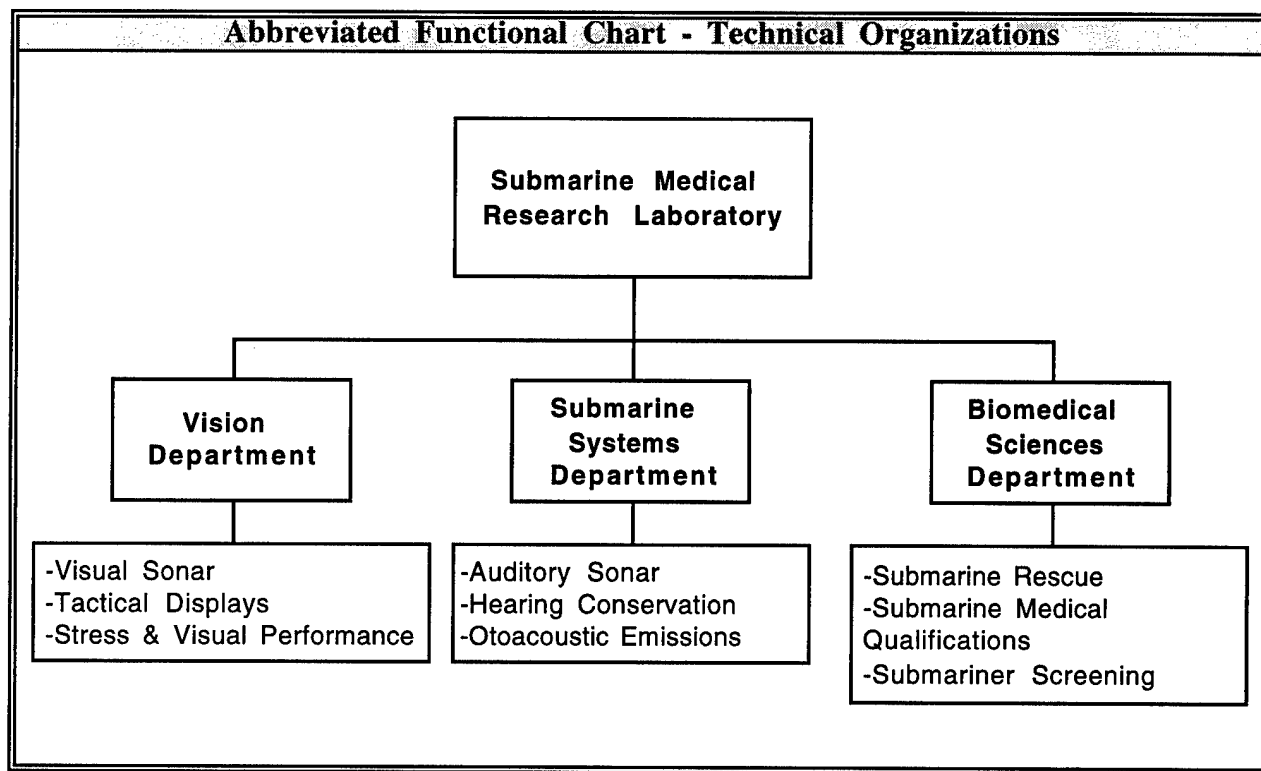
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	7	11	168	186
CIVILIAN	850	888	1,572	3,310
TOTAL	857	899	1,740	3,496

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	3,199.000	REAL PROPERTY	190.000
ADMIN	230.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	422.000	EQUIPMENT	455.000
TOTAL	3,851.000	* NEW SCIENTIFIC & ENG. EQUIP.	28.000
ACRES	556	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Submarine Medical Research Laboratory



Naval Submarine Medical Research Laboratory

Groton, CT 06349-5900
(860) 449-3266

CO: CAPT R. G. Walter, DC
Technical Dir.: CAPT Michael C. Curley, MSC

MISSION

Provide timely, high quality research and development to the submarine force to enhance auditory and visual sonar operator performance, submariner health and physical standards, closed environment atmospheric monitoring, submarine escape and rescue, and hearing conservation in both air and under the sea.

CURRENT IMPORTANT PROGRAMS

Medical problems associated with pressurized submarine rescue; reduction of attrition rates for submariners by better screening; improved performance on auditory, digital, and visual sonars; physiological performance effects of altered submarine atmospheres; hearing conservation; evoked otoacoustic emissions; tactical displays.

Sonar Display Enhancements - including development of headsets, analog and digital signal processing techniques, to maximize the intelligent, efficient use of man's visual and auditory systems.

Submarine Escape and Rescue - developing decision guidelines for survivors based upon physiological, engineering and operational factors, and providing guidance to operational commanders in establishing procedures and equipment for escape and rescue.

Submarine Clinical Issues - reducing the loss of talented personnel by instituting data-based decisions on Submarine Disqualifications/Waivers for conditions of kidney stones and asthma.

Hearing Conservation - developing guidelines for diver safe exposure limits to underwater noise from tools and sonars; exploring the use of evoked otoacoustic emissions to detect the early states of hearing loss.

Tactical Displays - providing ways to enhance operator performance by applying our knowledge of the human sensory systems, specifically using color, symbology, highlighting cues, orientation, and default presentations.

Psychiatric Screening of all enlisted and officer submarine candidates undergoing training at Basic Enlisted Submarine School and Submarine Officers Basic Course.

Submarine Atmospheres - develop and maintain a data base of submarine atmosphere constituents from varied data sources, answer such health questions that arise from data, and recommend better submarine atmospheric monitoring and control.

Submariner Mortality - epidemiological study of mortality rates for various causes of death in submariners compared to mortality in the general male population.

EQUIPMENT/FACILITIES

Laboratory facilities for use of up-to-date equipment and instruments to perform basic and applied research. Facilities include two-man rated 300 and 150 PSGI hyperbaric chambers. Complete exercise physiology lab; instrumentation shop; technical library; graphic arts and photography shop. Anechoic chambers; psychoacoustical lab; operational sonar simulation labs; mass spectrometers, gas chromatograph.

1. Multi-man, dual lock hyperbaric chamber that has been certified as an audiometric test facility. This quiet chamber is essential to electro-acoustic and psycho-acoustic research on the development of hearing conservation standards for diving operations. This test chamber also has the capacity to be altered to perform hypobaric operations.
2. A large reverberation room that is used for submarine habitability studies. Up to ten men may be housed within the room while being exposed to noise conditions. This facility is currently dedicated to the establishment of acoustic habitability standards for submarines and surface vessels using powerful low frequency sonar.
3. A large anechoic chamber that is used for studies of the ear in free-field conditions. This facility is used to make control measurements of the characteristics of the ear in order to develop models of the ear for spatial localization and synthesized localized three dimensional sounds (virtual reality). This facility is also required to explore the feasibility of free-field listening techniques for sonar operator displays.
4. Experimental vision/perception laboratory which includes photometric/spectroradiometric/optical bench equipment. No other DOD laboratory has developed a research thrust aimed at analyzing the visual display characteristics of sonar reception most compatible with the human operator.
5. A specialized computer automated psychoacoustics laboratory for experiments on sonar operator performance. This facility may be used to test four men at a time using advanced sonar target presentation techniques.
6. A sonar simulation facility also used for advanced studies of active and passive sonar operator performance using 'real-life' or simulated sonar contacts.
7. NSMRL has additional specialized laboratory facilities, i.e., biochemistry, gas chromatography/mass spectrometry, pulmonary physiology. These facilities, while not unique within DON or DOD, are essential in that they are dedicated to the specialized operational problems of submarine environments and crew health and safety considerations.

Naval Submarine Medical Research Laboratory
Groton, CT 06349-5900
(860) 449-3266

CO: CAPT R. G. Walter, DC
Technical Dir.: CAPT Michael C. Curley, MSC

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.985	0.000	0.985
6.2	0.000	0.000	0.000
6.3	1.276	0.000	1.276
Subtotal (S&T)	2.261	0.000	2.261
6.4	0.108	0.000	0.108
6.5	1.271	0.000	1.271
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.024	0.000	0.024
TOTAL RDT&E	3.664	0.000	3.664
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.140	0.000	0.140
Other	0.000	0.000	0.000
TOTAL FUNDING	3.804	0.000	3.804

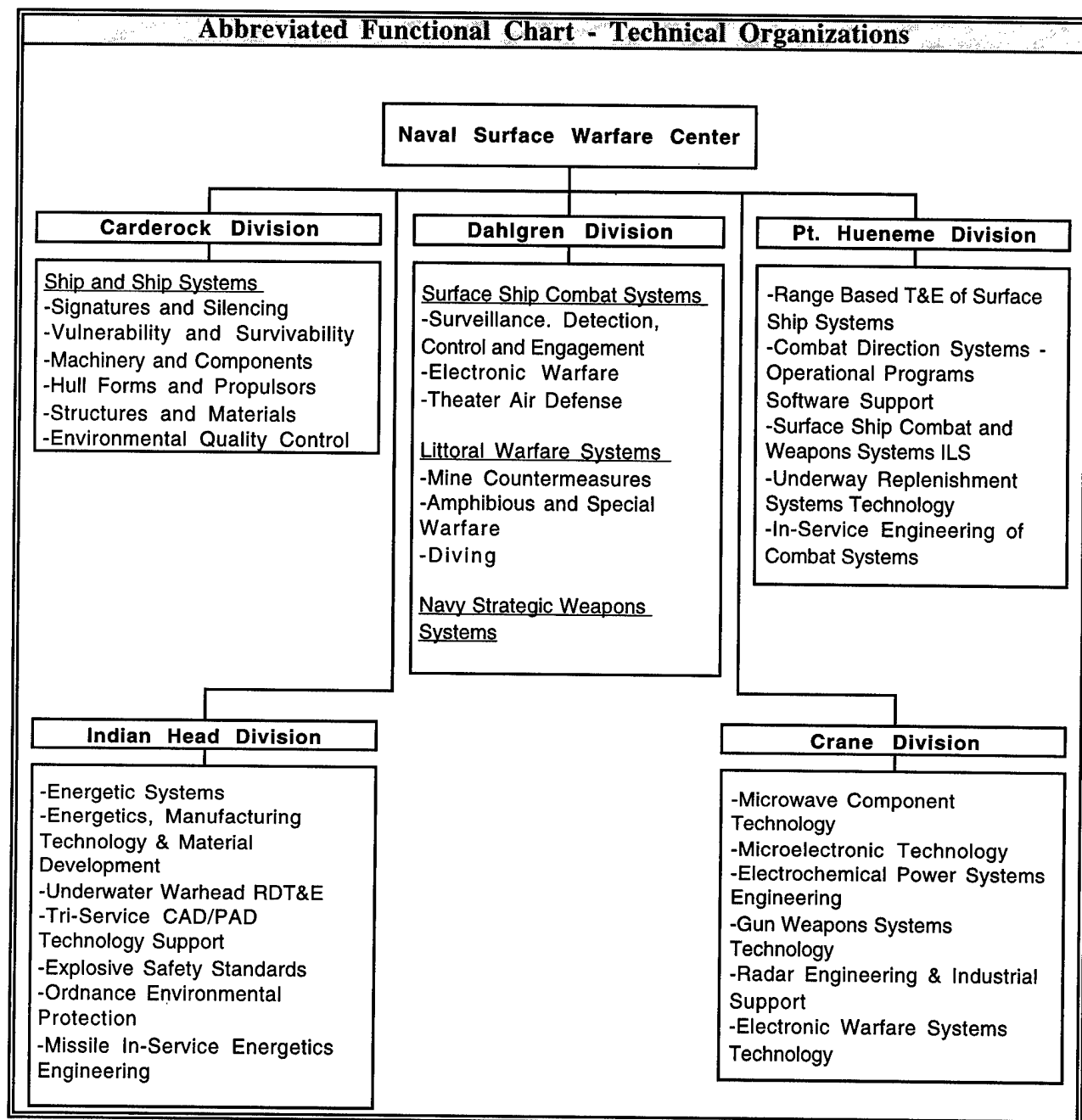
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	8	0	14	22
CIVILIAN	9	5	21	35
TOTAL	17	5	35	57

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	44.783	REAL PROPERTY	7.657
ADMIN	6.233	* NEW CAPITAL EQUIPMENT	0.000
OTHER	4.962	EQUIPMENT	4.936
TOTAL	55.978	* NEW SCIENTIFIC & ENG. EQUIP.	0.040
ACRES	0	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Naval Surface Warfare Center



Naval Surface Warfare Center
Arlington, VA 22242-5160
(703) 602-0632

Commander: RADM K.K. Paige.
Technical Dir.: Dr. Ira Blatstein

MISSION

Operate the Navy's full spectrum RDT&E, engineering and fleet support center for ship hull, mechanical and electrical systems, surface ship combat systems, coastal warfare systems, and other offensive and defensive systems associated with surface warfare.

CURRENT IMPORTANT PROGRAMS

Propulsion machinery systems and components test, evaluation and in-service engineering. Hull, mechanical and electrical (HM&E) auxiliary machinery systems and components test and evaluation and in-service engineering. HM&E electrical machinery systems and components test and evaluation and in-service engineering. Hull and deck machinery systems components test and evaluation and in-service engineering. Surface warfare modeling and analysis. Ship vulnerability and survivability. Surface and undersea vehicle hull machinery, propulsors and equipment. Platform systems integration AEGIS combat system. Ship self-defense, including the self-defense test ship. Cruise weapon systems-Tomahawk and Harpoon. Gun weapon systems. Standard missile. Continuous processing of composite propellants (an international cooperative R&D agreement to develop processing). Ordnance environmental R&D of energetics processing technologies. Gun propulsion R&D for the Navy's Electrothermal Chemical (ET-C) gun and Range Enhancement Near-Term (RENT) programs. Tri-service RDT&E, engineering, manufacturing, and fleet support for cartridges, cartridge and propellant actuated devices, and aircrew escape propulsion systems. RDT&E for Navy and Marine Corps Mine Countermeasures (MCM) including: distributed explosives technology, demonstrative/advanced countermeasure system, surf zone MCM, and shallow water MCM. Gun weapon system replacement program. MK 15 Phalanx close-in weapon system overhaul project. MK 45 gun engineering project. 76mm MK 75 program and life cycle support. SLQ-32 electronic countermeasures systems. Miniature/microminiature electronic repair. Precise integrated navigation systems (PINS) ISEA/ILS/DOP. AN/SYQ-13 navigation systems. Trident. Submarine Launched Ballistic Missile (SLBM) targeting. Unmanned Aerial Vehicle (UAV). Ship self-defense systems. Vertical Launch System (VLS). Gun ammunition. Mines. Warheads. ASW systems. EW systems. AEGIS radar, search and track. EM effects. Magnetic silencing. Chemical and biological defense. Ship/airborne mine CM combat system integration. Diving and life support. Special warfare. Amphibious warfare. Surface and Undersea Vehicle Acoustic and Non-Acoustic Silencing. Materials and Processing Technology for HM&E and Combat Systems. Environmental Quality Science and Systems.

Cooperative Research and Development Agreements

Dahlgren Division

1. Development of New Software Products Based on NSWCCD Supersonic Airflow Programs. The objective of this task is to develop new software products embodying (a) previously developed original work of NSWCCD on supersonic airflow programs embodied in the software package identified as 'ZEUS' and (b) the derivative work embodying trade secret data received from NEAR making the software products more suitable for commercialization by NEAR.

2. Development of Titanium Piping (including galvanic isolation and seawater treatment technology) to Prevent Corrosion, Erosion, and Blockage Due to Marine Growth in Cooling and Seawater Piping Systems Aboard Surface Ships. The objectives of this task are: (1) to determine feasible and cost-effective methods for preventing marine growth in shipboard titanium seawater piping systems, (2) to determine the impacts associated with fabrication and shipboard installation of titanium piping and

CURRENT IMPORTANT PROGRAMS (continued)

systems in a shipyard environment, and (3) to design an actual shipboard titanium seawater piping system and compare the performance and life-cycle cost impacts associated with the use of titanium vs. copper nickel for this system.

3. Collaboration to Investigate Material Processing Aspects and the Electronic Properties of Narrow Bandgap Semiconductors. The objective of this task is the collaboration between the Solid State Materials Group at NSWCDD and the Materials Research Center at the University of Puerto Rico for research and development of material processing aspects and electronic properties of narrow bandgap semiconductors.

4. Development of a New and Improved Launcher for the Shoulder-Launched Multi-Purpose Assault Weapon (SMAW). The objectives of this task are: (1) to develop and transition to production the SMAW lightweight launcher, (2) to develop and transition to production a new SMAW spotter round with acceptable ballistics and lower production cost, (3) the successful transfer of the current SMAW technical data package, and (4) to investigate and incorporate other system improvements, as appropriate.

5. Research and Development Contributing to the Understanding of High-Voltage Connector Technology in Low-Inductance Environments. The objective of this task is the research and development contributing to the understanding of high-voltage connector technology in low-inductance environments along with multiple usage scenarios. NSWCDD and Raymond Engineering (RE) will evaluate and characterize the performance of the RE-developed removable Exploding Foil Initiator (EFI) and connector.

6. Amphibious, Marine Corps, and Mine Warfare C4I. The objective of this task is to develop a communication architecture and command and control overlay for the real-time command of maneuver units within a littoral scenario. In particular, this agreement focuses on the information exchange requirements of maneuver units in an amphibious assault that includes mine countermeasures operations. This effort will address the suitability of land-based maneuver control system suites including radio and/or cellular communications devices to extend Joint Maritime Command Information System (JMCIS) to the individual unit/sailor or marine. The objective of this agreement is to significantly reduce the cost and shorten the development and deployment cycle of an integrated voice and data communication system that meets the near-term needs of current littoral operations and provides an architecture for joint operations and growth in the future.

7. PCR Destruction of Volatile Organic Compounds. The objective of this CRADA with Physics International is to perform a parametric study of the NSWCDD PCR in search of the least power deposited into the corona discharge per unit air flow that still destroys more than 98% of a 500 ppm toluene impurity in an atmospheric pressure air flow. Parameters involved in this investigation include (but are not limited to) voltage risetime, applied voltage pulse width, amplitude and rep-rate, and air flow through the PCR and humidity.

8. Compliant Barium-Compound Substrate Technology for Chemically Deposited PbS and PbSe Monolithic Focal Plane Arrays. The objective of this CRADA with Sensarray Corporation is to develop an enabling technology that would allow the integration of infrared optical detector arrays and silicon electronic circuitry onto a single substrate. The integrated sensors must satisfy the requirements for state of the art infrared detection in terms of spectral response, sensitivity, and temperature of operation. They should also have the capability of on-chip signal processing. The output of the sensors must be directly applicable for electronic decision-making and be commensurate with more complicated electronic processing for target detection and pattern recognition.

9. Technical Assistance to CIT. The objective of this agreement with Virginia Center for Innovative Technology is to transfer technology from NSWCDD to those companies in the Commonwealth of Virginia that through the CIT have requested such technology. It is expected that technology in the

CURRENT IMPORTANT PROGRAMS (continued)

fields of Devices and Sensors, Information and Systems Sciences, Advanced Data Processing Methods, Pulsed Power Technology, Simulation and Modeling, and Electromagnetic Environmental Effects will be of the most interest for Cooperative Research.

10. Evaluation of Loral on Environmental Remediation (13 Feb 1995 - 30 June 1996). Loral Federal Systems - Akron is conducting an internal R&D program to determine if an airborne laser is a suitable sensor to use for environmental remediation projects, such as, looking for small artillery shells scattered on the sea bed in shallow water. CSS will provide information on past experiences with boat-mounted lasers, provide information on test sites, give reviews of test and analysis reports, and list recommendations on the suitability of the airborne laser. This supports the CSS project MUDSS (Mobile Underwater Debris Sensor System).

11. Archaeology Survey Using SINS (13 March 1995 - 13 March 1998). The Florida State's University Marine Laboratory is conducting underwater archaeological surveys using traditional subsea mapping techniques. The Coastal Systems Station is providing to FSU manpower and equipment to map these regions with the SEAL In-shore Navigation System. This is providing CSS with the opportunity to test new equipment in controlled conditions and compare with traditional systems. FSU is gaining additional techniques in mapping and the use of new Navy equipment not commercially available.

12. OMNI Directional Vehicle Technology for Helicopter Support. AIR TRAX Inc. is developing new ground support vehicles for use with helicopters. Key to these vehicles is the development of a new ground platform which incorporates the OMNI Direction Vehicle technology which has been developed at the Coastal Systems Station. The Coastal Systems Station is benefiting through the development of new support platform of potential military use.

13. SDV-X Test and Evaluation (30 Sept 1996 - 30 September 1999). Columbia Research Corporation has preliminary design concepts for a Swimmer Delivery Vehicle which they wish to market to a foreign government. CC desires to use the expertise and facilities of the Coastal Systems Station to test and evaluate design and prototype vehicles.

Carderock Division

1. Use of Spinning Microfilters to Separate Oil from Water for Abatement of Marine Oil Spills. Working with Marine Spill Response Corporation, the objective of this task is to demonstrate technology to separate seawater from oil spill fluids in a wide range of viscosities using nonclogging spinning microfilter oil/water separator technology.

2. Technical Assistance to the University of Maryland Technology Extension Service. The objective of this agreement with the University of Maryland is to transfer technology from NSWCCD to those companies in the State of Maryland that, through UMCP, have requested technology assistance. It is expected that technology in the fields of chemical processing, testing, manufacturing technology, safety, electronics and environmental technology will be of the most interest for Cooperative Research.

3. Ben Franklin Technology Center (BFTC). The objective of this agreement with the Ben Franklin Technology Center is to transfer technology from NSWCCD to those companies in the Philadelphia metropolitan region that through the BFTC have requested such technology. It is expected that technology in the fields of 1) Acoustics, 2) Advanced Materials and Structures, 3) Environmental, 4) Machinery Systems and 5) Ship Technology will be of the most interest for Cooperative Research.

4. NAVATEK II Model Tests. The objective of this agreement with the Pacific Marine and Supply Company, Ltd. is to broaden NSWCCD's database for SWATH technology and validate model prediction techniques. A second objective is to improve the powering performance of NAVATEK II, and its seakeeping characteristics to refine and facilitate the commercialization of this technology by

CURRENT IMPORTANT PROGRAMS (continued)

Pacific Marine and Supply Company.

5. Recycling of Navy Ship Plastic Waste Into Marine Pilings. The objective of the work performed under this agreement with Seaward International, Inc. is to determine if Navy ship waste plastic can be used as a core in the construction of SEAPILE composite marine pilings without degradation of their performance characteristics.

6. Double Hull and Composite Material/Structure Technologies. Ingalls Shipbuilding, Inc. and NSWCCD will perform a cooperative research and development effort to develop composite material/structures and double hull structures and associated subelements and technology for surface ships. It is anticipated that the work conducted will result in designs that can be realized in advanced surface combatants, retrofit activities to same, and commercial applications alike. The goals for these new designs will be tailored for each application and will include, as appropriate, reduced weight, enhanced survivability, reduced maintenance, and comparable cost, or lower. Ingalls, upon successful completion of development, intends to carry out a plan for marketing the technologies for a variety of naval and commercial applications.

7. Study of Reduced Fire Hazard Silicone Materials For Navy Applications. The objectives of the CRADA with Dow Corning Corporation are to develop, document and evaluate silicone-based or silicone modified advanced fire resistant materials. Also, reformulate and optimize processing characteristics of the above mentioned polymeric materials to conform to Navy selected fabrication techniques. Facilitate successful fire resistant materials for use in commercial applications. Organize technical workshops involving Navy and Dow Corning personnel to further understand the needs and capabilities of the partners.

8. Black & Decker Company. Black and Decker is seeking assistance in determining the make up of the contamination residue on the terminals of their power tools. They need to confirm if there are polymers in the material causing the residue and if so what are they. This may be cause for premature loss of power.

9. Shipboard Power Systems Improvement Program. The objective of this CRADA with Westinghouse Electric Corp., Instrumentation & Control Sys. Dept. (WI&CSD) is to evaluate specific applications of WI&CSD developed power and control system designs and concepts to Navy and commercial ships. Successfully proven applications may later be shared with other Westinghouse Departments to improve commercial product lines.

10. Modular Utility Core. The objective of this partnership with Ben Franklin Technology Center is to jointly develop a modular utility core for low/moderate income housing. This core will be a prototype modular unit containing the mechanical, electrical and energy management systems for residential housing. The prototype modular utility core is intended to be fabricated at Naval Surface Warfare Center, Carderock Division Philadelphia, PA, transported to a residential site and installed into an existing house being rehabilitated.

11. Sensortex, Inc. In an agreement with Sensortex, Inc., NSWCCD will work towards providing a concept analysis of magnetosytrictive films which could be incorporated into medical monitoring device. This analysis is intended to identify the type of magnestorstrictive film which could be used as a constituent for the matrix addressable array intended for tactile and pressure sensing applications. Sensortex will provide information on the array requirements for these applications.

12. Combustion Research Associates. In an agreement with Combustion Research Associates, NSWCCD will work towards developing a sliding shoe arrangement for an internal combustion engine, the Rotorcam engine. Combustion Research Associates will provide design data, suggested material composition, loading requirements and drawings for the development of the sliding shoe. The sliding shoe is intended to replace a rotating cam follower.

CURRENT IMPORTANT PROGRAMS (continued)

13. NewPort Technologies, Inc. In an agreement with NewPort Technologies, Inc., NSWCCD will work towards providing an analysis on the performance characteristics of an alternative valve design for NewPort Technologies, Inc. This analysis is intended to identify valve design based on fluid flow, wall thickness and loading capacity. NewPort Technologies will provide design data and drawings for this analysis. NSWCCD intends to provide an analysis report which could consist of computer modeling data, fluid flow data, and design drawings.

14. Toroid Corporation. In an agreement with Toroid Corp., NSWCCD will work towards providing analysis of a Toroid Corp. transformer. This analysis is intended to identify the cause of high frequency noise. Toroid Corp. will provide the transformers for this analysis.

15. Dixon Valve & Coupling Co. In an agreement with Dixon Valve & Coupling Co., NSWCCD will work towards providing an analysis on the performance characteristics of a steam fitting test loop for Dixon Valve & Coupling Co. This analysis is intended to identify the preliminary design requirements for a steam test loop which could validate the performance of innovative steam hose fittings. Dixon Valve will provide design data and drawings for this analysis.

16. Capital Controls. NSWCCD will work with Capital Controls towards providing an analysis on the performance of a submersible chemical induction unit for Capital Controls, Inc. This analysis is intended to concentrate on the failure of the induction units seals to properly function. Capital Controls will provide design information, drawings and sample equipment for this analysis. NSWCCD involvement in this project is limited to four workdays of effort. A report on NSWCCD performance for this project will be provided to Capital Controls Co. at the conclusion of this project.

17. Liquid Carbonics. The objective of this task with Liquid Carbonic/Fluidynamic is the performance analysis by NSWCCD of Liquid Carbonic's post consumer plastic recycling process using plastic disks provided by NSWCCD Plastic Reduction Program.

18. Intelligent Shock Mitigation & Isolation System thru Applied RSPM Technology. The objective of the CRADA with ISMIS Consortium is to first perform the remaining development work to refine and upgrade RSPM control algorithms for Naval applications to meet a compelling need for Naval isolation technology; and secondly to scale up and test the fully integrated systems in mock-ups and simulators to verify the technology. The objective of the overall RSPM program is to create a commercially available family of ISMIS products through applied RSPM that will both meet the compelling need for Naval isolation technology and satisfy the uses of ISMIS in seismic protection of structures.

19. Light Scattering Measurement Techniques and Practices. The technical objective of the CRADA with Surface Optics Corporation is to develop standard materials for verifying polarized BRDF measurements in the visible and infrared spectral region. Currently there are no accepted standard materials for verifying Mueller matrix BRDF measurements in general, or for unpolarized scattering measurements in the infrared. Work performed under this CRADA will produce well characterized sample materials that can be theoretically analyzed to predict the polarized BRDF which can be used to verify the experimental measurements.

20. Precision Sea Systems Corp. In an agreement with Precision Sea Systems Corp., NSWCCD will provide assistance in designing an impeller driven system to assist deep sea divers with a propulsion system that will give more thrust and power with a smaller and lighter unit.

Crane Division

1. Southern Indiana Development Commission (21 June 1995 through 21 June 1998). The Southern Indiana Development Commission (SIDC) will provide Technology Access Services through this Agreement to technologically based companies having technical needs that are similar to Crane Division, Naval Surface Warfare Center's (CRDNSWC) skills. This technology access service

CURRENT IMPORTANT PROGRAMS (continued)

program, at SIDC will provide technology assessments, technology information services, and technology transfer engagements to firms in the region and CRDNSWC personnel. The purpose of this CRADA is to foster the transfer of technology from CRDNSWC to companies, in particular small businesses who request technologies through SIDC's technology access service. While all the types of technology that are available to be transferred and may be determined by CRDNSWC and SIDC to be of mutual interest are not specifically identified herein, the primary areas are:

- 1) Microelectronic Technology
- 2) Microwave Technology
- 3) Acoustic Sensor Technology
- 4) Failure Analysis/Materials
- 5) Night Vision/Electro-Optics Technology
- 6) NonDestructive Test

2. Indiana University (12 September 1995 through 12 September 1996). The goal of this CRADA is to provide analysis of the composite structural design of the module shell. This effort will provide for the Heat transfer and Finite Element (FEA) of this module shell design as developed by Indiana University and composite shell manufacturer.

3. Global Environmental Solutions (25 July 1995 through 25 July 1997). This CRADA will attempt to develop a booster charge to be marketed in commercial mining applications from Rockeye Bomblets, or other excess military explosives as agreed, which would otherwise be disposed of by open detonation. This process, if successful, will provide a demilitarization alternative which will eliminate unnecessary destruction of resources, reduce hazardous emissions from open detonation and provide a marketable product from a disposable asset.

4. Earth Conservancy (28 July 1995 through 28 July 1997). The goal of this CRADA is to develop and validate procedures for the removal of high explosive fillers from military projectiles using high pressure waterjets. This process, if successful, will provide a demilitarization alternative which will eliminate unnecessary destruction of resources and reduce hazardous emissions from open burning and open detonation.

5. Cinergy Technology, Inc. (9 August 1996 through 9 August 1999). CTI is entering into a CRADA with NAVSURFWARCENDIV Crane for the development and evaluation of the Proton Exchange Membrane (PEM) Fuel Cell Technology. NAVSURFWARCENDIV Crane intends to provide CTI further insight and recommendations in the development of the PEM fuel cell technology including its operating characteristics and reliability under various test applications. This CRADA will enable CTI to gain necessary information for the development of the PEM technology for commercial and industrial applications. NAVSURFWARCENDIV Crane is a leading U.S. military base in electrochemistry and power systems designs and applications and will add to its knowledge base with a focus of the technology to military applications. These applications include shipboard, submarine and man portable uses. The primary technology assessment vehicle is the Ballard Power Generating System (PGS) 103.

6. Interconnection Technology Research Institute (29 August 1995 through 24 September 1996). The purpose of the Printed Wiring Board (PWB) reliability development program is to experimentally determine the relationship between PWB hole to capture pad registration and reliability of the PWB. This reliability development program is undertaken as part of ITRI Project 126 on Advanced Registration.

7. Martin Marietta Corp. Automation Systems Company (24 March 1996 through 20 September 1999). This Agreement provides the framework for the reconfiguration of existing Consolidated Automated Support System (CASS) assets into a deployable Integrated Maintenance Management System (IMMS) for use on LClass and DDGClass Navy combatants.

CURRENT IMPORTANT PROGRAMS (continued)

8. American Competitiveness Institute (20 September 1996 through 20 September 1999). The Electronics Manufacturing Productivity Facility (EMPF), operated by the American Competitiveness Institute (ACI), is entering into a CRADA with NAVSURFWARCEM Crane for the development, application and transfer of new electronic manufacturing technologies to both military and commercial sectors. Under this cooperative agreement, Crane provides linkages with Navy and DoD programs to evaluate electronic manufacturing technology needs in light of Navy and DoD requirements. Crane is unique in that they represent in excess of 150 major and minor Navy customers within their organization, and have as one of their primary missions that of assisting these programs to field quality, reliable hardware that meets the intended mission parameters. EMPF/ACI's mission of providing the latest manufacturing technologies to the nation's electronics industry will be enhanced by Crane's participation in this agreement.

9. Endress & Hauser (12 1996 through 12 1999). The goal of this CRADA with Endress and Hauser company is to perform product validation, design modifications and development of two level measurement product lines which will utilize advanced high speed pulse (HSP) technologies obtained via a license from a Federal Laboratory.

10. Rose Hulman Institute of Technology (Educational Partnership) (27 March 1996 through 27 March 2001). The purpose of this Agreement is to aid in the educational experience of Rose Hulman students by providing a mechanism by which the students can benefit from the staff expertise, unique facilities and equipment related to undersea.

Indian Head Division:

1. Evaluation of Near Net Shape Casting for the Fabrication of Specialty Aerospace Components. The objective of the CRADA is to evaluate the feasibility, advantages and impact of fabricating metal aerospace components using net shape casting technology. This will be done through analysis of characteristics, building and loading specially designed prototype hardware and subjecting the loaded assemblies to environmental and performance tests.

2. Environmentally Safe Demilitarization Technologies for Conventional Ammunition. The objective of the CRADA is to mutually develop environmentally safe process for removal of energetic material from reusable motor casings.

3. Applied Research into Composite Air Bag Propellants. The objective of the CRADA is to utilize IHDIV manufacturing technology to develop processes originating with OEA, Inc. The ultimate goal would be a controlled release of a gas producing energetic material.

4. Technical Assistance to the University of Maryland's Technology Extension Service. The objective of this CRADA is to transfer technology from IHDIV to those companies in the State of Maryland that, through University of Maryland at College Park, have requested technology assistance. It is expected that technology in the fields of chemical processing, testing, manufacturing technology, safety, electronics and environmental technology will be of the most interest for cooperative research.

5. Application of Radiation Processing Technologies to the Manufacture and Demilitarization of Energetic Materials. The objective is for Damilic Corporation and IHDIV to mutually determine the feasibility of safely curing energetic materials and removing energetic material through radiation processing technology.

6. Applied Research into Instructional and Information Exchange Technologies. The objective of the CRADA is to develop, demonstrate, introduce and transfer new and evolving information technologies relating to training and instructional approaches. The technology will be transferred from the innovator (US Navy) to the user (Charles County Community College, Maryland) and further developed to meet mutual needs.

CURRENT IMPORTANT PROGRAMS (continued)

7. Applied Research into Laser Initiated Explosive Subsystems. The objective of the CRADA is to use a process designed by Ensign-Bickford Company to determine sensitivity and safety aspects with Navy propellant formulations.

8. Advanced Modular Arm-Fire Device for Multiple Applications. The objective is to integrate advanced technology, such as found in EFI detonators, 'smart electronics' and miniaturized sensors, for the purpose of demonstrating and evaluating low cost, advanced explosive initiation technology.

9. Evaluation of Biotechnology to the Treatment of Nitrate Ester Contaminated Wastewater with High Inorganic Nitrates. The objective is to evaluate the effectiveness, efficiency, and compatibility of applying EFX's biotechnology solutions to explosive processing waste streams.

Personnel Exchange

Dr. Harold Szu of NSWCCD served as a Lamson Professor and the Director of the Center for Advanced Computer Studies at the University of Southwestern Louisiana (Lafayette, LA) during the 95-96 academic year. In addition to being Director of the Center, he taught neural networks and wavelets courses at the graduate level.

EQUIPMENT/FACILITIES

Dahlgren Site: Potomac River Test Range, EM Vulnerability Assessment Facility, Search and Track Sensor Research Facility, Warhead Research Test Facility, Aegis Computer Center, Explosives Experimental Area, EM Pulse Facility, Phalanx Instrumented Test Facility, Anechoic Test Facility, Chem-Bio Eng Facility, Hypervelocity Wind Tunnel, Nuclear Weapons Radiation Effects Complex, General purpose labs, Compartmented laboratory.

Dahlgren Coastal Systems Station Site: Expeditionary Warfare Modeling and Simulation, Mines and Mine equipment and systems, Specialized Mine Warfare, Transducers and Sonar Modeling for MCM, Special Warfare Mission Equipment, Ocean simulation to 2,250' depth, Diving and Life Support Systems Development and Analysis, Fleet Diving Support Complex, Gulf Test Range, Magnetic Detection and Classification Range, Mine Exploitation Complex, Specialized Environmental Testing, Pier Space, Boats, Heliport Complex with Equipment.

Crane: Overwater radio frequency (RF) test range. Surveillance radar overhaul facility. Special equipment and computers for microelectronics technology. Electron linear accelerator. Materials analysis instrumentation. State-of-the-art CAD/CAE modeling and simulation tools and automated test equipment which accommodate any range of circuit card technology. Thick film circuit card manufacturing laboratory.

Carderock Philadelphia Site: Full-scale Improved Performance Machinery Program (IPMP) (SSN-21) steam propulsion land based test site. Full-scale LSD-41 diesel propulsion land based test site. Full-scale DDG-51 gas turbine land based test site. Full-scale electric drive/machinery module land based test site. Full-scale gear meteorology and calibration lab. Full-scale air compressor test site. Full-scale submarine life support test site. Full-scale submarine generator test site. Full-scale submarine ship service generator test site. Fire, pollution, marine equipment lab. Full-scale conveyor and elevator test complex. Full-scale submarine mast bending test facility. Full-scale submarine periscope/antenna test sites. Full scale submarine buoy communication test site. Chemistry and metallurgy lab. Full-scale gravimetric flow calibration lab. Test operations. Analysis and control center. Full-scale steam propulsion testing complex.

EQUIPMENT/FACILITIES (continued)

Carderock Division - Patuxent River, MD: Special trials unit; surface effects test ship.

Carderock Division - Memphis, TN: Large Cavitation Channel (LCC).

Carderock Bethesda Site: Simulation, planning and analysis research center. Explosives test pond. Data and image processing systems. David Taylor Model Basin complex. Maneuvering and seakeeping basin. Rotating arm basin. Radio-controlled model facility. Circulating water channel. 24-inch and 36-inch cavitation channels. Dynamic control system simulator. 140-foot towing basin. Hydrodynamic/hydroacoustic technical center. Deep submergence pressure tanks. Structural evaluation lab. Wind tunnels.

Carderock Annapolis Site: Fire research and air contamination facility. Machinery systems silencing lab. Acoustics materials lab. Magnetic fields lab. Low observable materials lab. Advanced electrical machining. Technology and development facility. Submarine fluid dynamics facility. Electric power tech lab. Metallic materials and processing facility. Marine composites lab. Marine coatings and corrosion control facility. Marine tribology lab. Deep ocean pressure simulation facility. Shipboard environmental protection facility.

Carderock Division - Portsmouth, VA: Shock trials instrumentation.

Carderock Division - Bayview, ID: Acoustic research detachment.

Carderock Division - Santa Cruz, CA: Acoustic range facility, radar imaging facility.

Carderock Division - Bremerton, WA: Carr inlet test facility.

Carderock Division - Ketchikan, AK: Southeast Alaska facility.

Carderock Division - Panama City, FL: Lauren & Athena research vessels/ship systems.

Carderock Division - Cape Canaveral, FL: Research Vessel Hayes.

Carderock Division - Norfolk, VA: Combatant craft engineering detachment.

Indian Head: Continuous processing facility. Composite case/component overbraiding facility. Synthesis and scale-up facilities for all types of energetic materials. Test facilities. Surface Warfare Engineering Facility. Electrostatic Discharge (ESD) facility.

Port Hueneme Division, Port Hueneme, CA: Surface Warfare Engineering Facility.

Port Hueneme Division, San Diego, CA: Integrated Combat Systems Test Facility (ICSTF).

Port Hueneme Division, Dam Neck, VA: Software program generation and life-cycle maintenance laboratories.

Naval Surface Warfare Center
Arlington, VA 22242-5160
(703) 602-0632

Commander: RADM K.K. Paige.
Technical Dir.: Dr. Ira Blatstein

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	8.500	N/A	8.500
6.1 Other	3.800	2.800	6.600
6.2	79.900	50.700	130.600
6.3	59.100	56.300	115.400
Subtotal (S&T)	151.300	109.800	261.100
6.4	219.000	165.300	384.300
6.5	105.000	69.800	174.800
6.6	15.100	18.700	33.800
6.7	53.100	67.500	120.600
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	543.500	431.100	974.600
Procurement	329.600	426.200	755.800
Operations & Maintenance	355.900	209.200	565.100
Other	251.300	159.500	410.800
TOTAL FUNDING	1,480.300	1,226.000	2,706.300

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	20.500

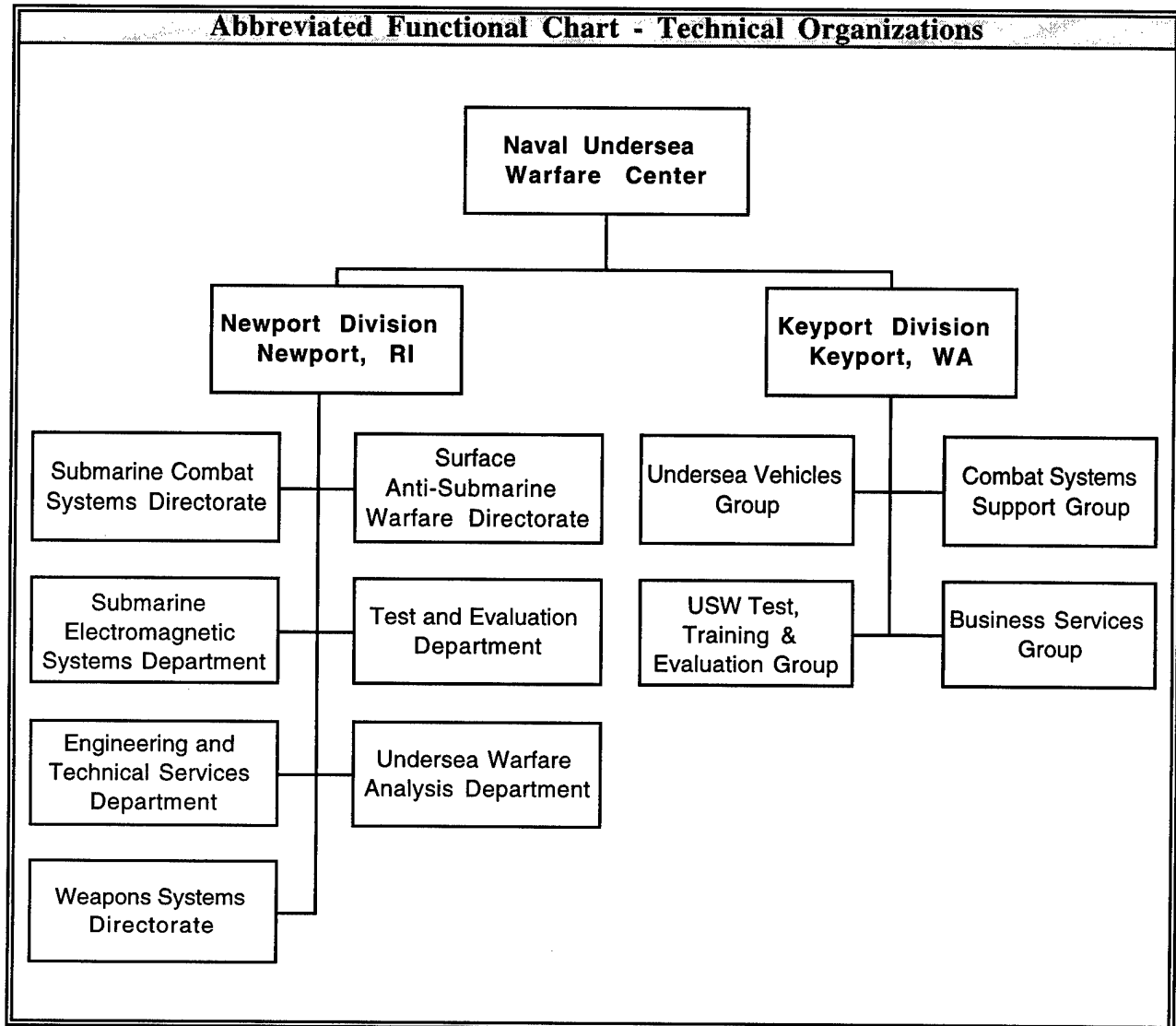
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	1	30	442	473
CIVILIAN	376	6,817	9,211	16,404
TOTAL	377	6,847	9,653	16,877

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	6,651.000	REAL PROPERTY	1,107.800
ADMIN	1,710.000	* NEW CAPITAL EQUIPMENT	8.600
OTHER	12,283.000	EQUIPMENT	1,030.700
TOTAL	20,554.000	* NEW SCIENTIFIC & ENG. EQUIP.	8.700
ACRES	72,521	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Naval Undersea Warfare Center



Naval Undersea Warfare Center
Newport, RI 02841-1708
(401) 841-6761

Commander: RADM John F. Shipway
Technical Dir.: Dr. John E. Sirmalis

MISSION

The Naval Undersea Warfare Center (NUWC) Mission promulgated by OPNAVNOTE 5450 Ser 09B22/1U510577 dtd 23 Dec 91 is as follows:

'Operate the Navy's full spectrum research, development, test and evaluation, engineering, and fleet support center for submarines, autonomous underwater systems, and offensive and defensive weapon systems associated with undersea warfare.'

CURRENT IMPORTANT PROGRAMS

SCIENCE AND TECHNOLOGY

The Naval Undersea Warfare Center conducts a comprehensive Science and Technology program in support of its mission that spans In-House Laboratory Independent Research (ILIR), Basic Research, Exploratory Development, and participation in Advanced Technology Demonstrations. Current emphasis areas include:

- Submarine Combat Control - contact management, weapon targeting, engagement planning and advanced information management concepts
- Submarine/Surface Ship Sonar - shallow water active classification, high gain systems, active surveillance systems, full signature processing, deployable surveillance systems
- Torpedoes - propulsion systems, hydrodynamics/drag reduction, noise reduction/acoustics, countermeasure technologies, Unmanned Undersea Vehicles (UUV's), and launchers
- Submarine Communications - advanced submarine communications architectures, communication at speed and depth, mast antenna technology, and advanced Arctic communications

UNDERSEA WARFARE (USW) MODELING AND ANALYSIS

- New USW Program Capability Assessment
- Analysis of Alternative (AOA)/Cost and Operational Effectiveness Analysis (COEA) for Acquisition Programs
- Investment Strategy Options Development
- Early Operational Assessment
- Intelligence Data Assessment
- USW Requirements Analysis
- Derivation of USW Technology Goals
- Coordinated ASW Force Assessments
- Submarine and USW Synthetic Environments
- COMOPTEVFOR USW Trusted Agent

SUBMARINE, SURFACE SHIP AND AIR LAUNCHED TORPEDOES, TORPEDO/SONAR COUNTERMEASURES, UUVS, ASSOCIATED LAUNCHER SYSTEMS AND MISSILES

- Torpedo MK 48/MK 48 ADCAP Program
- Torpedo MK 50 Program
- Torpedo MK 46 Program
- Lightweight Hybrid Torpedo Program
- Torpedo MK 46/MK 48 FMS Program
- Tomahawk Cruise Missile (Submarine-Launched)

CURRENT IMPORTANT PROGRAMS (continued)

- Encapsulated Harpoon Weapon System
- Submarine Weapon Simulators and Test Vehicles
- Integrated Diagnostic Support System
- Submarine Torpedo Tubes
- SSN-21 Launcher Systems
- Turbine Pump Ejection Systems
- Submarine Weapon Handling
- SSN-688 Vertical Launch System
- Surface Ship Torpedo Tubes
- New SSN Launcher Systems
- Submarine External Countermeasure Launchers
- Submarine Internal Auxiliary Launchers
- Elastomeric Ejection Systems
- Submarine Advanced Launch Technology
- Adaptable High Speed Undersea Munitions

SUBMARINE SONAR

- AN/BQQ-5
- AN/BQG-5 Wide Aperture Array
- TB-16F, -23 and -29 Submarine Towed Arrays
- Submarine Sonar Advanced Development
- AN/WLY-1 AN/WLR-9
- New SSN Sonar Subsystem
- AFTAS
- RATTRAP
- Acoustic Rapid COTS Insertion
- Sonar Advanced Development
- Transducer Tech Direction/Support Program
- AN/BSY-1 Acoustics
- Submarine Ancillary Sonar Systems
- Affordable Array Technology (ATD)
- Ultra Thin Line Array
- Thin Optical Towed Array
- Acoustic Comms (ATD)

SURFACE SHIP SONAR AND ASW SYSTEMS

- AN/SQQ-89 ASW Combat System
- Combat Data Collection
- Surface Ship ASW Advanced Development
- Carrier ASW Module
- Surface Ship Torpedo Defense
- AN/SQR-19 Tow Array Sonar
- AN/SQS-53 A,B,C Active Hull Sonar
- AN/SQQ-28 Sonobuoy Processor
- Tactical Advanced Simulated Warfare Integrated Trainer (TASWIT)
- KINGFISHER
- AN/SQQ-30 Mine Classifying-Detecting Set
- AN/SQQ-32(V) Mine Hunting Sonar
- OK-520/SQQ Common Winch
- AN/SSN-2(V) Precise Integrated Navigation System
- AN/SYQ-13 Navigation, Command & Control System
- AN/SSQ-94 Combat System Integrated Training Equipment
- AN/WQN-1 Detecting-Ranging Set -Echo Track Classifier
- Shallow Water Active Detection Classification

CURRENT IMPORTANT PROGRAMS (continued)

- Surface Combat 21st Century
- Lightweight Broadband Variable Depth Sonar
- Towed Active Receiving System (TARS)

SUBMARINE COMMUNICATIONS, ELECTRONIC WARFARE SUPPORT MEASURES (ESM),
ELECTRO-OPTICS SYSTEMS/PERISCOPES

- Navy EHF SATCOM Program
- Submarine Communication Support System Baseband Switch
- Submarine Integrated Antenna System
- On-Hull ELF Antenna
- OE-538 Multifunction Mast Antenna
- SHF HDR Phased Array Antenna Advanced Technology Demonstration
- Extremely Low Frequency (ELF) Communications
- Integrated ESM Mast
- Advanced Submarine Tactical Electronic Combat System (ASTECS)
- AN/WLR-8 High Probability of Intercept Receiver
- AN/BST-1 Submarine Emergency Communications Buoy
- Photonics Mast
- Electro-Optic Sensor Development and Acquisition
- Submarine Periscopes Program
- EMC ADVISORY BOARDS (EMCAB)

NEW SSN, SEAWOLF, LOS ANGELES AND TRIDENT CLASS SUBMARINE COMBAT, AND
COMBAT CONTROL SYSTEMS

- NSSN
- AN/BSY-2, AN/BQG-5 Submarine Combat System
- Combat Control Systems MK 2
- Seawolf Non-Propulsion Electronics
- Trident Command and Control System
- Missiles: Combat Control
- Module Test and Repair Program
- Trainers
- Sensor Performance Computer Based Tactical Aids
- Advanced Tomahawk Weapons Control System

UNDERSEA RANGES:

- Atlantic Undersea Test and Evaluation Center (AUTEC)
- Fleet Operational Readiness Accuracy Check Sites (FORACS) at St. Croix, Oahu, and San Clemente Island
- Tactical Underwater Range Development
- Southern California ASW Range
- Portable Tracking System
- SWIFT Tracking System
- Kwajalein Missile Impact Scoring System
- Barking Sands Tactical Underwater Range Development
- Australian Underwater Tracking Range
- Range Technology Development
- Dabob Bay Range Development and Operation
- NanOOSE Deep Water Tracking Range Development and Operation
- Quinault Shallow Water Range Development and Operation
- Hawaiian Island Underwater Range (HAIUR) Site
- San Clemente Island Underwater Range (SCIUR) Development and Operation

CURRENT IMPORTANT PROGRAMS (continued)

- Air Operations Support (PACER)
- Surface Ship, Submarine, and T-AGOS-Class Ships Radiated Noise Measurement

TECHNOLOGY TRANSFER

The Naval Undersea Warfare Center conducts an extensive technology transfer program that is structured to make technology developed for defense purposes available to the academic and commercial communities. The main mechanics for technology transfer are:

* Patent Program - NUWC operates a highly efficient patent program believed to be one of the most productive in U.S. government (patents per scientist/engineer). In FY96, 169 invention disclosures were recorded, 161 patent applications were filed, and 99 patents were issued or allowed (86 patents and 13 classified allowances (D-10)).

* Cooperative Research and Development Agreements (CRADAs):

- o Lockheed-Martin - Explore and exploit massively parallel processing as applicable to sonar processing
- o Connecticut Municipal Electric Energy Cooperative - Design electric vehicle sensor measurement system and improved operator console
- o MedAcoustics, Inc. - Demonstrate signal-processing algorithms to process acoustic signals within the cardiac cycle
- o Institut Supérieur d'Electronique - Investigate the physics of close-packed acoustic array element interaction phenomena
- o Precision Signal, Inc. - Develop state-of-the-art equipment to map deep and shallow-water ocean floors
- o General Dynamics/Electric Boat Division - Further the development of Computational Fluid Dynamics to meet current and future Navy needs
- o Florida Atlantic University - Exchange remote oceanographic sensing and unmanned underwater vehicle technology
- o Connecticut Municipal Electric Energy Cooperative - Investigate electric vehicle electromagnetic interference, measurement and mitigation
- o University of Massachusetts - Oil spill monitoring using multiple autonomous underwater vehicles
- o Next Century Power - Fabrication and testing of nickel-zinc cell batteries
- o University of Maine - Develop a method of predicting the deformation of nets deployed in an ocean environment
- o Lucent Technologies - Develop ultra-thin array technology
- o Yale University School of Medicine - Bio-medical model development
- o Loctite Corporation - Material property measurement
- o Draper Laboratory - Co-development of unmanned underwater vehicle technology
- o Foster-Miller, Inc. - Demonstrate low-cost, expendable bottom-crawling vehicles for ocean bottom explorations
- o Public Service Electric and Gas Co. - Material development, testing and evaluation for shielding capability in electromagnetic fields
- o Rhode Island Technology Transfer Center - Technical assistance to Rhode Island's technically-based companies
- o CytoTherapeutics, Inc. - Prototype packaging for medical devices using stereolithography
- o Westfall Manufacturing Co. - Design verification and representation of a static fluid mixing device for water treatment processing
- o Niche Medical, Inc. - Assistance in the design of a surgical smoke plume collector
- o Team One USA - Refine the design, development and manufacture of small boat/mission modules for high performance multi-mission craft
- o Vitro Corp. - Develop a graphical Environmental Management Information System (EMIS) to track hazardous materials and hazardous waste

CURRENT IMPORTANT PROGRAMS (continued)

- o Virtual i/O, Inc. - Develop head-mounted display system hardware and software for military applications including shipboard systems battlefield training simulations
- o 4-Cycle, Inc. - Develop conversion kits for small, high-output internal combustion 2 cycle and 4 cycle engines
- o Economic Development Council of Kitsap County, WA - Foster technology transfer between NUWC Division, Keyport and small businesses in the area
- o Sound Ocean Systems, Inc. - Develop deep diving (to 6000 meters) recovery capability with flexible attachments capable of performing a wide variety of tasks

* Educational Partnership Agreements (EPA's) - NUWC has the Navy's first two EPA's:

- o Oceansciences, Inc. - to provide undersea science and technology educational guidance and assistance for an ocean sciences camp and museum to further math and science education.
- o The University of Massachusetts - to aid in the undersea science and technology education of students and faculty.

EQUIPMENT/FACILITIES

The Naval Undersea Warfare Center maintains and continuously improves numerous facilities on both coasts designed to support the Research, Development, Test, and Evaluation of Undersea Warfare (USW) systems. On the East Coast, Naval Undersea Warfare Center, Division Newport, RI, groups their facilities into 7 major complexes:

UNDERSEA WARFARE MODELING AND ANALYSIS COMPLEX

This complex has developed and maintains a suite of USW models, databases and U.S. and foreign weapon system hardware-in-the-loop simulations. These are exercised in support of requirements analysis, tactical development, concept development and performance assessment from system level through force and theater levels. This complex comprises two components:

The Undersea Warfare Analysis Laboratory (USWAL) component consists of distributed computer servers linked together via a high speed network and tied to a centralized file server. This architecture, combined with an intelligent queuing system provides the USWAL with a specialized simulation environment that outperforms the combined power of multiple supercomputers. The Weapons Analysis Facility (WAF) simulation component provides a massively parallel processing synthetic environment which integrates a variety of actual weapon hardware and software within its specialized architecture. Thus, real weapons are allowed to perform mission scenarios in the highest fidelity virtual environment the U.S. Navy has developed. The combined computing engines in this complex achieve a maximum throughput exceeding 40 GigaFlops.

SUBMARINE COMBAT (SC) AND COMBAT CONTROL SYSTEMS (SCC) COMPLEX

This complex is a unique set of 4 world-class facilities that combine leading-edge synthetic environment and analysis technology with submarine tactical system hardware representing current and future combat systems in a networked laboratory setting. Linked and interconnected with other NUWC and external government, private industry and university facilities, the complex provides expanded virtual environments for conducting research and development (R&D) in technical and operational problems confronting the submarine force. Areas of R&D include information management, weapon employment, joint operability, battle group interoperability and battle space management. SC&CCS's facilities are available for use by government organizations, private industry, and academic institutions.

EQUIPMENT/FACILITIES (continued)**SUBMARINE AND SURFACE SHIP SONAR COMPLEX**

This complex is a unique set of 13 facilities that include platform independent and federated laboratories and robust simulation and stimulation used to explore the underlying science and technology common to submarine and surface ship sonars. These facilities encompass the research, development and test of acoustic sensors, transducers, and arrays for use in tactical, calibration and standards applications at sites ranging from laboratory test beds and large scale pressure vessels to inland lakes and ponds. This complex provides the Navy with the capability to explore the technologies and science associated with transduction materials, fiber optics, environmental acoustics, and measurement and analysis techniques, leading to development of hull mounted, towed, and expendable sensors and arrays. Sonar systems laboratories consist of specialized sites for the investigation of signal processing, operator displays, detection and classification algorithms, acoustic communication, acoustic intercept, system architecture, onboard trainers, and commercial off-the-shelf applications utilizing robust simulation/stimulation capabilities to perform system evaluation, performance analysis and life cycle support.

SUBMARINE COMMUNICATIONS, ELECTRONIC WARFARE, AND ELECTRO OPTICS COMPLEX

This test complex permits full characterization of submarine exterior communications, electronic and imaging warfare systems and their related antennas/sensors by using unique laboratories and in-the-field test facilities. Stimulation/simulation equipment that replicates advanced radio frequency (RF) emitters, specialized test equipment, and RF anechoic chambers provides highly accurate measurement of systems baseline performance, transmit and receive patterns, and radar cross section signatures. A remote, electromagnetically quiet, test site on Fishers Island, NY, is used to measure systems performance with antennas/sensors operating in the sea water aerosol simulating actual submarine operations.

SUBMARINE LAUNCHER COMPLEX

This complex is a unique array of 9 major facilities dedicated to full spectrum support to submarine launcher programs for weapons, vehicles, and countermeasures from submarines. The facilities provide the capabilities for evaluating new launcher developments and improvements, land-based acceptance testing, and troubleshooting Fleet problems. The Transient Launch Facilities are the only known facilities in the world capable of conducting hydrodynamic and hydroacoustic tests of transient flows and torpedo ejection pumps. The Submarine Launch System Test Facility replicates full-scale launch systems on SSN-688 and SSBN-726 class submarines and is capable of firing dummy weapons at simulated depths from surface to submarine test depth. Dual ejection capability allows for concurrent, side-by-side firing comparisons of any two current or future candidate ejection systems. The Advanced Submarine Launch Facility replicates the full-scale launch system on SSN-21 and is capable of launch system performance testing and measuring radiated sound pressure levels in a unique Ocean Simulation Tank.

TORPEDOES AND UNDERSEA VEHICLES COMPLEX

This complex includes over 20 major facilities for design, development, test, and life cycle support of Navy torpedoes, countermeasures, unmanned undersea vehicles, and undersea targets. Torpedo and other vehicle system designs are developed and maintained in the complex's state-of-the-art Simulation-Based Design Facility. Its Propulsion Test Facilities support electric and thermal (open and closed cycle) propulsion system developments and include the Deep Depth Propulsion Test Facility, the only land-based facility capable of testing entire torpedoes to maximum power and depth; a High Energy Chamber, designed to contain the total energy content of advanced propulsion systems in a environmentally safe manner; and the Propulsion Noise Test System, the only land-based facility capable of measuring radiated noise of operational underwater vehicles on land. The complex also includes the world's quietest anechoic wind tunnel, a 64,000 cubic foot anechoic

EQUIPMENT/FACILITIES (continued)

chamber, the largest reverberant test tank of its kind in the country, the Navy's only large scale sea-water tow tank (3000 feet long) and an advanced materials laboratory, all of which provide comprehensive hydrodynamic, structural and acoustic data on components, as well as on full systems. Development and evaluation of vehicle sonars, guidance and control systems and software are accomplished in the unique Life Cycle Support Facility. It includes undersea vehicle testbeds, allowing the capability to integrate new software with vehicle guidance and control hardware and test it under simulated in-water operating conditions.

UNDERSEA RANGES COMPLEX

ATLANTIC UNDERSEA TEST & EVALUATION CENTER (AUTEC) AUTEC is a comprehensive open ocean test and evaluation complex located in the ocean waters off Andros Island in the Bahamas. The AUTEC ranges allow testing of aircraft, surface ships and submarines in an instrumented, calibrated 230-square-mile ocean area with precision tracking in three dimensions of all platforms. AUTEC also provides measurement systems for basic acoustic, environmental, and oceanographic research and test programs. AUTEC's facilities are available for use by U.S. and foreign government organizations, private industry, and academic institutions.

NEWPORT LITTORAL UNDERSEA WARFARE TEST FACILITY COMPLEX

The complex is a unique combination of test and tracking facilities and test environments in the Northeast. These facilities and environments represent potential areas of regional conflict (Persian Gulf, Gulf of Oman, coast of Korea) and have been well characterized, contain baseline performance data on existing systems, and can be supported cost effectively by nearby shore activities. The unique Gould Island Elevator/Launch System, deep water piers, and test areas immediately adjacent to NUWCDIVNPT are especially effective for testing systems in shallow water in an effective and affordable manner.

SHALLOW WATER DIESEL SUBMARINE TARGET

The decommissioned diesel submarine USS SALMON is instrumented and bottom-moored in 300 feet of water. It provides sonar targets for development of new systems and acts as a training aid for submarines transiting the area aiding in detection and classification of bottom targets.

UNDERSEA WARFARE TEST AND EVALUATION ANALYSIS FACILITY (UWTEAF)

This facility is unique in that it enables training, test and evaluation in synthetic environments. UWTEAF serves as the communications link between simulation and analysis laboratories, T&E and training ranges, and submarines and surface ships. Linkages between ranges, simulators and trainers, government and private laboratories (i.e. geographically separated test facilities) allows for more simulation, less live testing; virtual prototyping; integrated constructive and virtual simulation with live tests; and fully stressed threat environment in training exercises.

On the West Coast, NUWC Division, Keyport, WA maintains and operates a variety of Testing and Engineering facilities to support their mission of providing test and evaluation, in-service engineering, maintenance and repair, fleet support, and industrial base support for undersea weapons systems, countermeasures, and sonar systems. A listing of major facilities for Division Keyport follows:

PACIFIC NW RANGE SYSTEM

There are three unique, highly instrumented test sites in NUWC Division, Keyport's Northwest Range system, with over 100 square miles of littoral and mid-depth underwater tracking area, including inshore shallow water sites. While these sites are principally underwater test ranges, they also have extensive surface and in air tracking capability. Water depths, specialized instrumentation, bottom

EQUIPMENT/FACILITIES (continued)

recoverability, acoustic quietness, and security factors facilitate a wide range of Undersea Warfare vehicle and platform tests from Research and Development to production acceptance and Fleet evaluation/exercise. All range sites are linked to the Range Information Display Center (RIDC) at Keyport, where operations can be viewed, controlled, and analyzed in real time. The RIDC facilitates efficient range operations by minimizing travel to the range sites. Using large screen video and associated monitors, it provides encrypted real-time displays and fusion of range data (tracking, acoustics, and telemetry, plus two-way video and secure communications) from all Northwest Range sites. The northwest Range sites include Dabob Bay, Nanoose, and Quinault. Both Nanoose and Dabob are used extensively for development tests based on the capability to recover one-of-a-kind test vehicles intact, even if they sink.

The Nanoose range site is jointly operated and maintained on a shared basis by the United States and Canada and is located in the Strait of Georgia near Vancouver Island in British Columbia, Canada. Canada also provides extensive range craft support and facilities at no cost to the United States. It is also an excellent site for countermeasure testing because of its robust, short-baseline tracking configuration and its capability to track while most countermeasures are in use.

The Dabob Bay range site is located in Hood Canal near Naval Submarine Base, Bangor and is among the quietest and most secure instrumented underwater ranges in the world. This is especially important in the testing of new, quiet, and leading-edge technologies which are under development.

The Quinault test site is approximately 10 miles off the coast of Washington and offers the Navy's only fully-instrumented, shallow underwater environment. It meets the NATO 40-meter shallow water requirement and can provide support for the expanding shallow water antisubmarine warfare emphasis, including mine warfare testing and training

RANGE LAUNCH, RECOVERY, AND TARGET CRAFT

Yard Torpedo Test (YTT) craft are an integral part of the range operations for both U.S. and Canadian ranges. These unique, highly specialized vessels provide launch, fire control, and bottom recovery for the full spectrum of the Navy's undersea weapons, targets, and countermeasures. The YTT's were built specifically for use on the Northwest Range System. The ability of specially designed torpedo recovery systems installed on these craft to recover, intact and undamaged, torpedoes that have become embedded in the soft mud bottoms of the Northwest Range System is a unique Navy asset. Smaller support craft satisfy other specialized range needs such as surface retrieval, acoustic measurement, and target deployment.

RANGE INFORMATION DISPLAY CENTER (RIDC)

The RIDC facilitates efficient range operations by minimizing travel to the range sites. Using large screen video and associated monitors, it provides encrypted real-time displays and fusion of range data (tracking, acoustics, and telemetry, plus two-way video and secure communications) from all Northwest Range sites.

UNDERSEA WEAPON EVALUATION FACILITY (UWEF)

The UWEF is a hardware-in-the-loop test system which permits land-based captive testing of complete undersea weapons and other vehicles operating under their own power in a land-based water-filled test chamber.

SHIPBOARD ELECTRONIC SYSTEMS EVALUATION FACILITIES (SESEF)

The primary purpose of the SESEF is to improve Fleet readiness by providing Fleet units with an operational and material evaluation of all shipboard electromagnetic radiating and receiving systems.

EQUIPMENT/FACILITIES (continued)

NUWC Division, Keyport operates and maintains 3 SESEF sites, located in Southern California at Point Loma, San Diego; in MIDPAC at Barbers Point, Hawaii; and in PACNORWEST at Ediz Hook, Washington.

UNDERSEA WEAPONS REPAIR AND MAINTENANCE DEPOT

This highly specialized state-of-the-art complex is the Nation's only defense repair and maintenance depot for the Navy's full arsenal of developmental, in-service and retiring undersea weapons, torpedoes, mobile mines, and targets. This complex is comprised of 14 specialized weapons shops, repair facilities, and testing laboratories. Since depot repair processes require responsible handling of hazardous materials, wastes, and explosive components, unique explosive handling and environmental storage equipment and facilities have been developed. Special environmental equipment and facilities are on-line to handle the decontamination, storage, reclamation and disposal of hazardous materials such as OTTO fuel II and lithium.

TORPEDO EXPLOSIVE OPERATING COMPLEX

The complex includes 8 buildings for the explosive assembly, disassembly and repair of all undersea weaponry currently in the active U.S. Navy inventory. This complex has been sited within the same Explosives Safety Quantity Distance arcs as their adjacent torpedo storage magazines.

TORPEDO STORAGE MAGAZINES

These 72 specially constructed magazines constitute the Navy's only resource for consolidation of torpedoes being laid-up or 'bunkered' as a result of reductions in Fleet platforms. The U.S. Navy's entire MK 48 torpedo inventory and approximately one half of the MK 46 torpedo inventory will be bunkered over the next few years. These magazines are dedicated to torpedo storage and as such, represent the only explosive torpedo storage facilities available to accommodate the thousands of torpedoes to be bunkered.

WEAPON ACCEPTANCE AND OPERATIONAL TEST FACILITY

Provides data reduction and analysis for R&D testing, Operational Testing (conducted by COMOPTEVFOR), and weapon acceptance testing (Proofing) for underwater weapons and vehicles.

HARDWARE ENVIRONMENTAL TEST FACILITY

This facility consists of four test laboratories, each specifically equipped for one of the four major test functions of dynamic/climatic testing, mechanical testing, electrical testing, and explosive testing. The primary role of these facilities is testing Naval undersea weapons, targets, mines, countermeasures, and combat systems, but the facility also supports other weapon systems, government agencies, and commercial activities.

COMBAT SYSTEMS FACILITY

This facility is comprised of a newly constructed MILCON of 74,000 square feet designed and built specifically to meet the needs of operational Combat Systems. This facility includes integrated labs comprised of Fast Attack Submarine (SSN) Combat Systems, Fleet Ballistic Missile Submarine (SSBN) Combat Systems, Aircraft Carrier Anti-Submarine Warfare Systems, and ancillary equipment. The installed Fleet hardware provides a means for the test and evaluation of the various in-service engineering products of the facility.

TARGET MK 30 IMAS, AND RANGE TRACKING PINGER IMAS

Target turnaround facilities are located at Barking Sands, Kauai, Hawaii, North Island, San Diego,

EQUIPMENT/FACILITIES (continued)

California, and Keyport, Washington. Pinger facilities are located at Lualualei, Oahu, Hawaii, North Island, and Keyport. The Navy's only pinger repair depot is located with the pinger IMA at Lualualei.

TRANSDUCER AUTOMATED TEST FACILITY

Acoustic tests are conducted in a 30-foot diameter by 30-foot deep, freshwater filled, redwood tank. A 4-foot diameter, acoustically transparent, graphite-epoxy pod is available for transducers acoustically while being subjected to pressures of up to 2,000 pounds per square inch.

UNDERWATER NOISE ANALYSIS FACILITY (UNAFAC)

Comprised of state-of-the art signal playback, processing, and analysis systems used in the assessment of the acoustic performance of torpedoes, countermeasures, acoustic targets, and other underwater vehicles.

MIDPAC RANGE SYSTEM

This Range System consists of the Hawaiian Island Underwater Range (HAIUR), Fleet Operational Readiness Accuracy Check Site III (FORACS III), and Surface Ship Radiated Noise Measurement (SSRNM) test facilities. It is located within 20 nautical miles of Pearl Harbor, on the western coast of the Island of Oahu, Hawaii. HAIUR is instrumented with a long baseline, asynchronous tracking system and offers depths from 2500-ft to 3500-ft. The Range System provides test and evaluation support for NAVSEA-sponsored RDT&E programs and the Fleet.

SOCAL RANGE SYSTEM

This facility is located in the San Diego, California area at San Clemente Island. The range system consists of the San Clemente Island Underwater Range (SCIUR), Surface Ship Radiated Noise Measurement (SSRNM), and Fleet Operational Readiness Accuracy Check Site. This site offers a long baseline, asynchronous tracking system with depths to 3900-ft. Surface and air tracking capabilities are also provided.

RAPID PROTOTYPING AND FABRICATION FACILITIES

A wide variety of state-of-the-art equipment, fabrication techniques, and processes are available for prototype in support of RDT&E and emergent Fleet requirements.

Other facilities operated by NUWC Division Keyport in support of RDT&E programs include: Arctic Submarine Laboratory; Material, Chemical and Failure Analysis Laboratories; Mechanical and Electronic Repair and Assembly Facilities; Industrial Waste Treatment Facility; Recycling Facility; Hyperbaric Chamber; Post-operational Analysis Critique and Exercise Review (PACER) Facility; and Navy Mine Depot Hawthorne, NV.

Naval Undersea Warfare Center
Newport, RI 02841-1708
(401) 841-6761

Commander: RADM John F. Shipway
Technical Dir.: Dr. John E. Sirmalis

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	2.200	N/A	2.200
6.1 Other	2.000	0.600	2.600
6.2	20.200	6.800	27.000
6.3	5.100	6.200	11.300
Subtotal (S&T)	29.500	13.600	43.100
6.4	40.200	27.900	68.100
6.5	66.300	49.300	115.600
6.6	9.200	25.700	34.900
6.7	26.000	27.300	53.300
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	171.200	143.800	315.000
Procurement	125.800	160.800	286.600
Operations & Maintenance	99.300	72.300	171.600
Other	86.800	55.800	142.600
TOTAL FUNDING	483.100	432.700	915.800

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	4.250

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	1	28	192	221
CIVILIAN	154	2,652	2,687	5,493
TOTAL	155	2,680	2,879	5,714

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	3,321.000	REAL PROPERTY	284.551
ADMIN	189.000	* NEW CAPITAL EQUIPMENT	2.941
OTHER	2,090.000	EQUIPMENT	571.000
TOTAL	5,600.000	* NEW SCIENTIFIC & ENG. EQUIP.	36.000
ACRES	3,263	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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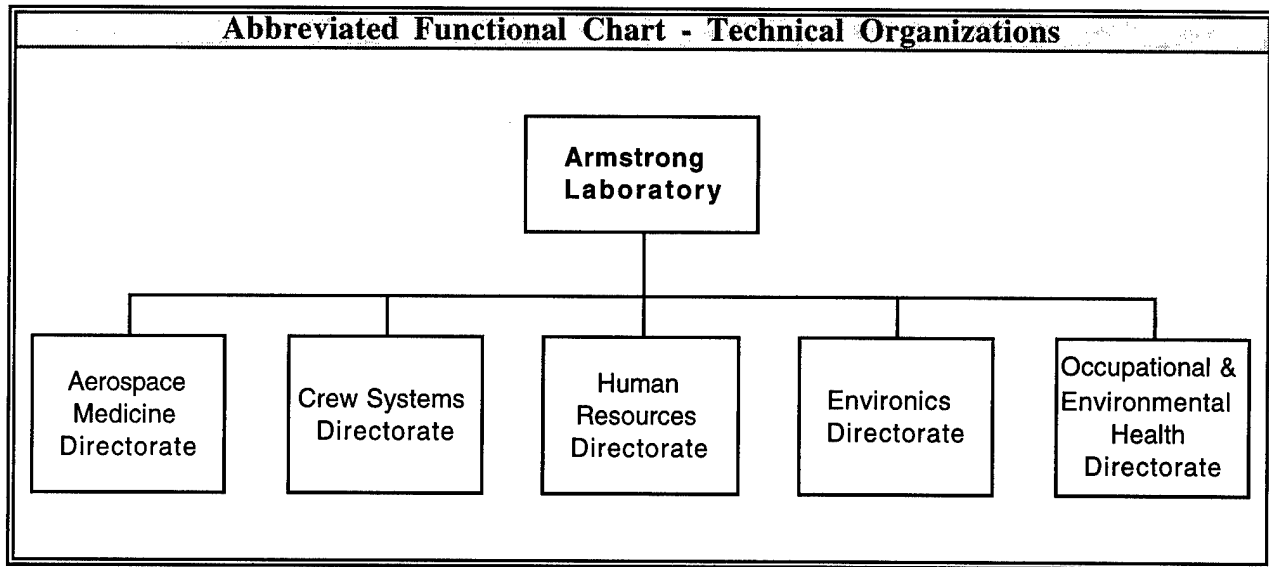
DEPARTMENT OF THE AIR FORCE

DEPARTMENT OF THE AIR FORCE

The Air Force's seven (7) In-House RDT&E Activities are:

Armstrong Laboratory	4-2
Arnold Engineering Development Center	4-6
Development Test Center	4-10
Flight Test Center	4-14
Phillips Laboratory	4-18
Rome Laboratory	4-22
Wright Laboratory	4-26

Armstrong Laboratory



Armstrong Laboratory
Brooks AFB, TX 78235-5118
(210) 536-3234

Director: Dr. Brendan B. Godfrey
Deputy Director: Col Terence J. Lyons

MISSION

Advance and apply technology to provide the Air Force with superior capabilities in the areas of human resources, crew systems, aerospace medicine, environics, and occupational/environmental health through integrated execution of research, development, and operational support. Sponsor and conduct research and development in the fields of biodynamics, biocommunications, environmental compliance, site restoration, toxic hazards, radiation/directed energy bioeffects, aeromedical selection/retention, human engineering, crew protection/life support, logistics and human factors, force acquisition and management, job skill development and retention, instructional strategies, and training devices.

CURRENT IMPORTANT PROGRAMS

The resources of the Armstrong Laboratory are organized into five integrated 'thrusters' which bridge specific research programs and projects. Technical thrust areas are: crew systems; human resources; aerospace medicine; occupational and environmental health; and environmental quality. The Armstrong Laboratory is also host to 'Tri-Service Research Centers' in toxicology and directed energy, created in accordance with the Project Reliance initiative for DoD laboratory consolidation. The principle types of technology transferred to commercial industry by Armstrong Laboratory are: environmental compliance and remediation, intelligent training, human safety standards and equipment, health care, logistics and human performance enhancement.

EQUIPMENT/FACILITIES

The Armstrong Laboratory conducts S&T at Wright-Patterson AFB OH, Brooks AFB TX, Tyndall AFB FL, and Mesa AZ. Equipment and facilities include: Two human centrifuges, a high on-set rate centrifuge located at Brooks AFB and a multi-axis centrifuge located at Wright-Patterson AFB; hypobaric and hyperbaric chambers with capability to simulate high altitude subzero conditions; anechoic chambers for study of human and noise interactions; 'virtual worlds' for systems and training research; inhalation toxicology chambers; directed energy laboratory to research bioeffects of lasers and RF radiation; human isolation facility for controlled study of group dynamics in simulated air operations; a TEMPEST secure facility with simulators for EW research and training; a facility for testing subjects (mostly new recruits) in S&T of computer automated training and force management tools; energetics research facility at Tyndall AFB with highly specialized research equipment to study the dynamic effects of contaminants on air and groundwater to include: a model aquifer for tracking groundwater plumes, an environmental spherical chamber for studying atmospheric fate and transport of contaminants, and a perfusion chromatograph system for separation of environmental macromolecules.

Armstrong Laboratory
 Brooks AFB, TX 78235-5118
 (210) 536-3234

Director: Dr. Brendan B. Godfrey
 Deputy Director: Col Terence J. Lyons

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	2.200	4.200	6.400
6.2	44.300	39.300	83.600
6.3	4.800	58.100	62.900
Subtotal (S&T)	51.300	101.600	152.900
6.4	3.200	2.200	5.400
6.5	0.100	19.900	20.000
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	2.100	0.100	2.200
TOTAL RDT&E	56.700	123.800	180.500
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	3.500	25.100	28.600
TOTAL FUNDING	60.200	148.900	209.100

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	97	189	452	738
CIVILIAN	139	167	506	812
TOTAL	236	356	958	1,550¹

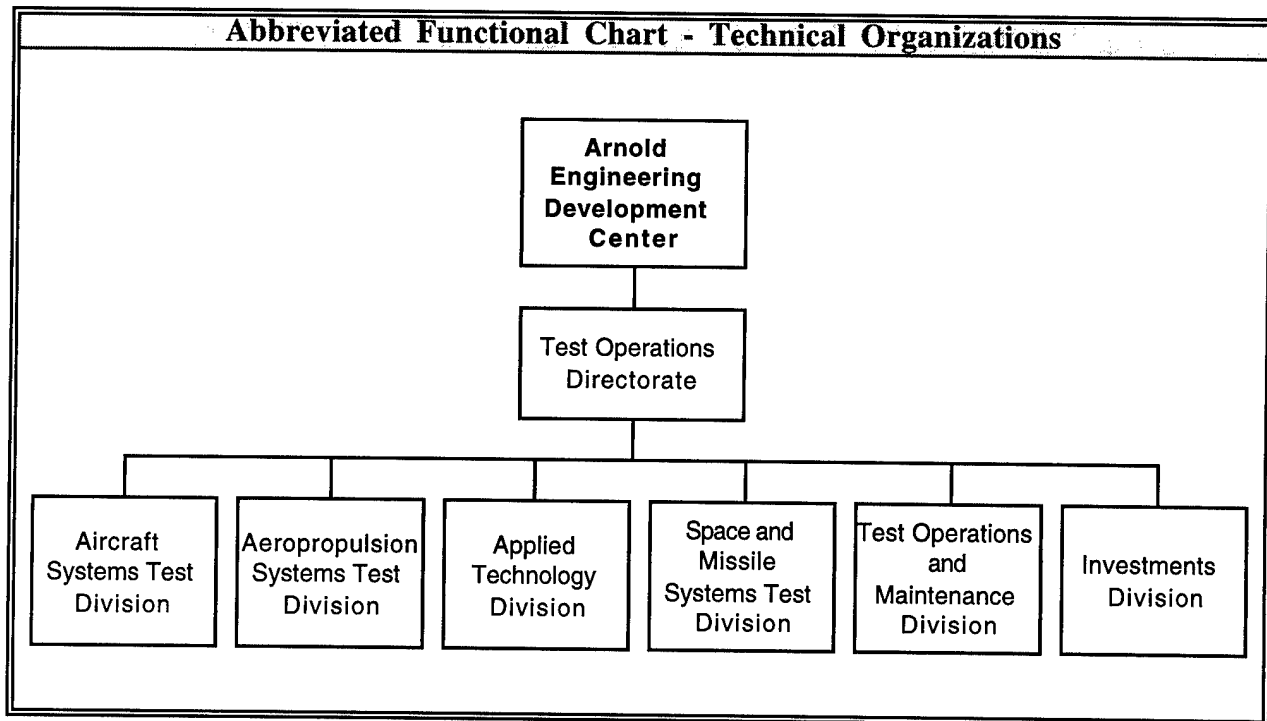
SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,034.000	REAL PROPERTY	64.860
ADMIN	157.000	* NEW CAPITAL EQUIPMENT	0.308
OTHER	1.000	EQUIPMENT	74.116
TOTAL	1,192.000	* NEW SCIENTIFIC & ENG. EQUIP.	3.016
ACRES	96	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

¹ Total includes 529 Non-RDT&E Defense Health Services, Counternarcotics, and Environmental Support personnel.

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Arnold Engineering Development Center



Arnold Engineering Development Center
Arnold AFB, TN 37389-5000
(615) 454-3000

Commander: Col Mike P. Wiedemer
Executive Director: John M. Rampy

MISSION

To provide customers with the world's most effective and affordable aerospace ground test and evaluation and simulation products and services. Includes testing aircraft, missile, and space systems and subsystems at flight conditions that will be experienced during actual missions. AEDC also conducts a research and technology program to develop advanced testing techniques and instrumentation and to support the development of new test facilities. AEDC's external customers include the Department of Defense, other government agencies, commercial companies, and foreign governments.

CURRENT IMPORTANT PROGRAMS

The most significant programs supported by AEDC in FY96 were:

1. F-22 Fighter and F119 Engine
2. Titan IV
3. F-15 Fighter and F100 Engine
4. F-18 Fighter
5. F-16 Fighter

EQUIPMENT/FACILITIES

Included are wind tunnels with sections to 16 ft. and speeds from subsonic to Mach 20; turbine engine test cells which provide simulation to Mach 3; rocket test cells, the largest rates at .5 million lbs. thrust at altitude; dust and snow erosion facilities; a bird impact facility; and two captive trajectory systems. These facilities have supported development and qualification of most major aeronautical, missile, and space systems since 1954. This testing complements expensive and often hazardous flight testing and assures that system deficiencies are found early, saving time and resources in the overall development, acquisition, and deployment process.

Arnold Engineering Development Center
 Arnold AFB, TN 37389-5000
 (615) 454-3000

Commander: Col Mike P. Wiedemer
 Executive Director: John M. Rampy

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	258.659	30.699	289.358
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	258.659	30.699	289.358
Procurement	0.000	0.000	0.000
Operations & Maintenance	7.958	0.024	7.982
Other	2.051	0.120	2.171
TOTAL FUNDING	268.668	30.843	299.511

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	2.700

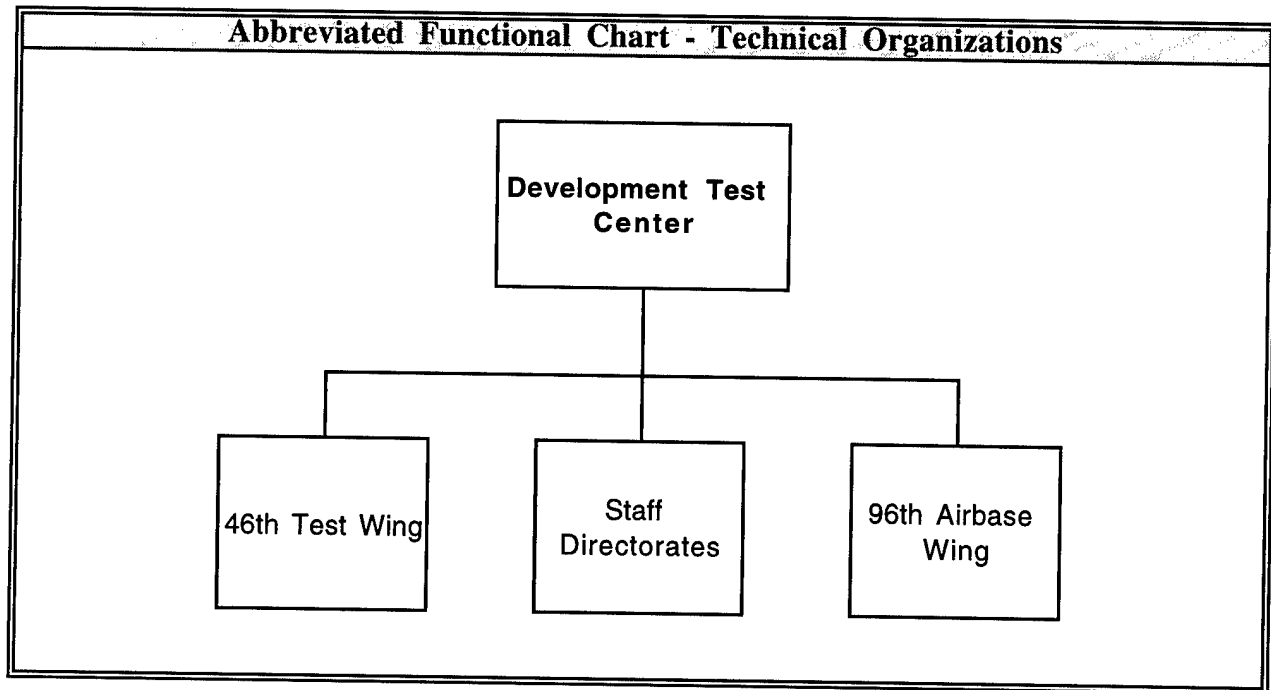
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	23	88	111
CIVILIAN	4	62	109	175
TOTAL	4	85	197	286

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,089.000	REAL PROPERTY	1,331.000
ADMIN	374.000	* NEW CAPITAL EQUIPMENT	12.014
OTHER	1,231.000	EQUIPMENT	235.460
TOTAL	2,694.000	* NEW SCIENTIFIC & ENG. EQUIP.	2.442
ACRES	39,081	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Development Test Center



Development Test Center
Eglin AFB, FL 32542-5498
(904) 882-3931

Commander: MG Stewart E. Cranston
Exec. Director: Dr. J. Daniel Stewart

MISSION

Provide a national capability for test and evaluation of defense weapons systems and satisfy diverse customer requirements with world-class facilities, expertise, and support resources.

CURRENT IMPORTANT PROGRAMS

The following list contains some of the more important test programs at the Air Force Development Test Center (AFDTC):

Advanced Medium Range Air-to-Air Missile* - T&E includes flight test and hardware-in-the-loop testing at the Guided Weapons Evaluation Facility (GWEF) for an improved autopilot and improved electronic counter-counter measures (ECCM).

Hellfire - Production lot and pre-planned product improvement (P3I) testing of Hellfire and Longbow Apache Hellfire Modular Missile Systems.

Chicken Little** - A joint Army-Air Force weapons evaluation program. It is hosted at Eglin where signature data on mobile ground targets is collected.

Joint Stars - Tests are conducted on Eglin ranges to evaluate Joint Stars capability to detect and track various targets in various environments.

Seek Eagle - Air Force stores compatibility program hosted at Eglin AFB. Flight tests to verify weapon separation simulations are conducted on Eglin ranges.

F-15E Test Electronic Warfare Systems - Electronic counter measure performance testing.

Sensor Fuse Weapons - Production lot testing and P3I testing.

Joint Tactical Information Distribution System - Some of the testing of information transfer among various types of JTIDS terminals is conducted on Eglin ranges.

Joint Direct Attack Munition* - JDAM is a joint Air Force-Navy program. Development, Test and Evaluation test planning and flight testing are conducted.

Joint Stand Off Weapon* - JSOW is a joint Navy-Air Force program. The Air Force portion of the testing is supported by the 46th Test Wing at AFDTC.

Air Intercept Missile - 9X - This program is a joint Air Force-Navy program led by the Navy. The 46th Test Wing is principal test office with specific testing not yet defined.

CURRENT IMPORTANT PROGRAMS (continued)

Advanced Short Range Air-to-Air Missile (British) and Various Allied Weapons - A component of allied munitions testing.

The following are Technology Transfer Programs providing unique T&E facilities/capabilities for commercial use. Capabilities are followed by actual commercial test efforts (if applicable):

Advanced Transportation and Automotive - Accomplish vehicle and automated highway systems tests in varying climatic conditions; test sensors under controlled electromagnetic environment; collision avoidance sensor tests.

Law Enforcement and Security - Intrusion, surveillance, access control, and weapons and ammunition testing.

Medical Equipment - Characterize electromagnetic emissions of equipment; test compatibility with helicopters, aircraft, or ambulances; test systems under controlled climatic conditions.

Communications and Information - Test and evaluate command and control systems. LSA, Inc. - laser communications.

Commercial Aviation - Test aircraft in climatic chamber; evaluate electromagnetic compatibility in large anechoic chamber; test on open air ranges. Interstate Electronics - advanced GPS navigation equipment.

Environmental - Use infrared and other technologies to test forest fire detection, and pollution detection; Apply expertise in environmental monitoring, restoration and field data collection. Accu-Weather - software evaluation for weather assessment.

Software/Modeling and Simulation - Access CRAY Supercomputer; use AFDTC developed software products.

* Navy and Air Force Joint Programs

** Army and Air Force Joint Programs

EQUIPMENT/FACILITIES

Capabilities and facilities include those for armament and C4I testing. The only DOD location with contiguous major land (724 sq. mi.) and water test ranges (122,726 sq. mi.), and the largest climatic test facility in the free world. Equipment and facilities include: a DOD High Performance Computing Center (real time and post mission support); airborne and ground based multispectral signature measurement; kinetic energy test facility (sled track); static warhead arenas; gun test facility; combined hardware and simulations testing (Guided Weapons Evaluation Facility - GWEF) and Preflight Integration of Munitions and Electronic Systems (PRIMES) facility; time-space-position information; telemetry systems facilities including airborne relay; airborne and surface targets; ground threat systems; base installation and security systems (BISS) test facility; photographic laboratory; marine operations (over water test support); and aircraft maintenance (test associated) facilities.

Development Test Center
 Eglin AFB, FL 32542-5498
 (904) 882-3931

Commander: MG Stewart E. Cranston
 Exec. Director: Dr. J. Daniel Stewart

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.200	4.520	4.720
6.6	229.420	244.090	473.510
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	229.620	248.610	478.230
Procurement	0.000	0.030	0.030
Operations & Maintenance	8.280	11.260	19.540
Other	29.600	14.880	44.480
TOTAL FUNDING	267.500	274.780	542.280

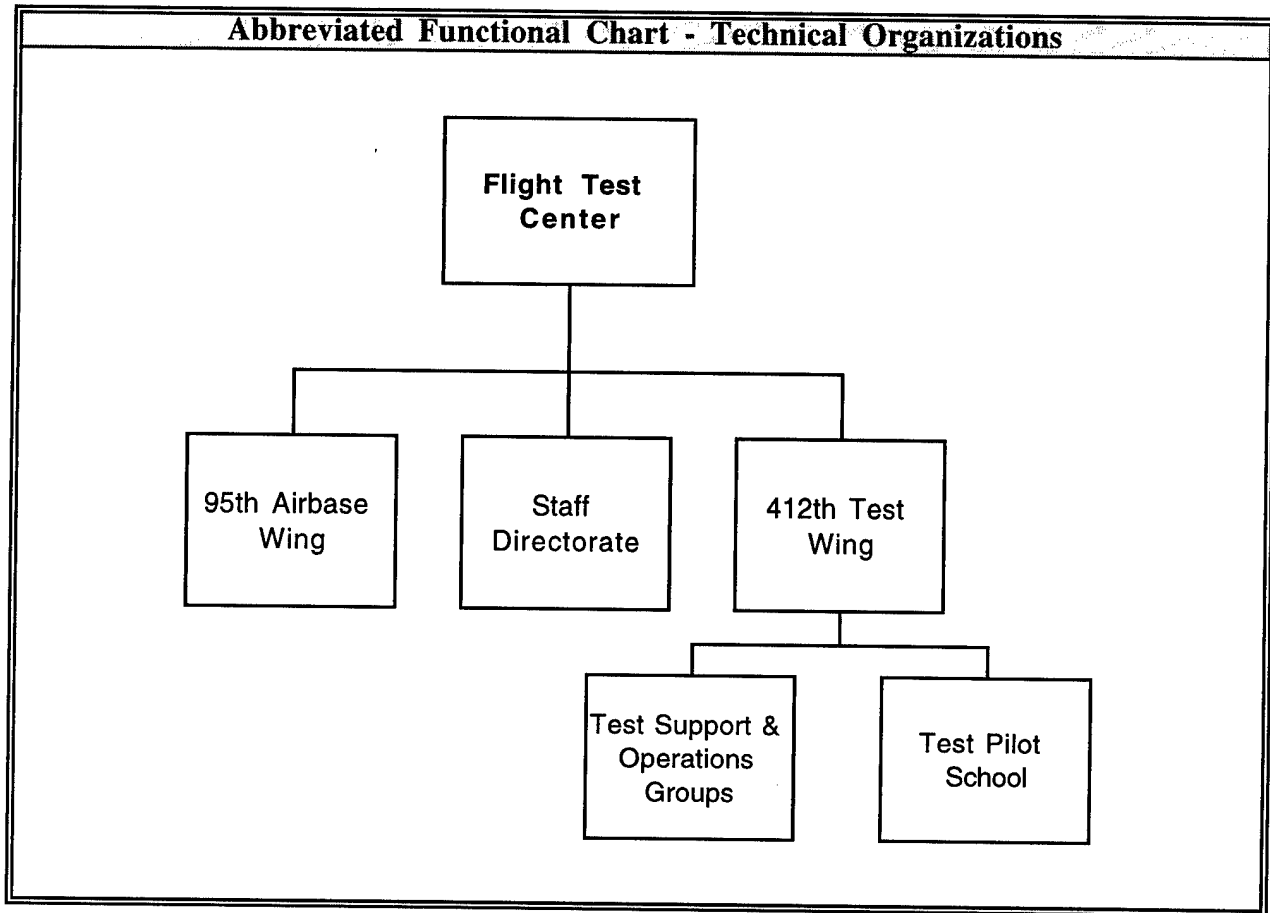
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	37.530

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	0	59	4,415	4,474
CIVILIAN	6	433	1,937	2,376
TOTAL	6	492	6,352	6,850

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,801.631	REAL PROPERTY	687.176
ADMIN	829.156	* NEW CAPITAL EQUIPMENT	0.000
OTHER	12,613.440	EQUIPMENT	409.690
TOTAL	15,244.227	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	463,115	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Flight Test Center



Flight Test Center

Edwards AFB, CA 93524-1000
(805) 277-3837

Commander: BG Richard L. Engel
Exec. Director: Richard L. Hildebrand

MISSION

The Air Force Flight Test Center (AFFTC) is charged with supporting the Air Force Material Command (AFMC) mission by conducting and supporting research, development, test and evaluation of manned and unmanned aerospace systems. This mission involves not only all aspects of testing of aerospace systems and subsystems, but also includes development testing of aerodynamic decelerators and the operation of the Air Force Test Pilot School. To support this testing the AFFTC operates and manages the Edwards Flight Test Range and the Utah Test and Training Range. The Center operates a fleet of test bed aircraft for early development and check out of new avionics. The Center also operates a fleet of Advance Range Instrumentation Aircraft (ARIA) for worldwide support to a variety of space and missile tests. The Center supports and participates in research, development, test and evaluation programs for other Air Force Commands, other Departments of Defense and government agencies, as well as for contractors and foreign governments.

CURRENT IMPORTANT PROGRAMS

The following are some of the important development and follow-on programs on which the AFFTC is currently working: B-1 bomber avionics and conventional weapons upgrades; B-2 bomber; B-52 bomber upgrades; C-17 transport; C-130J transport; Air Mobility Command Simulator upgrades, F-15 fighter; F-16 fighter; F-117 fighter; F-22 Advanced Tactical Fighter; Joint Strike Fighter, JPATS trainer aircraft; LANTIRN and BIG CROW.

EQUIPMENT/FACILITIES

Major unique facilities and equipment include: Integrated Facility for Avionics System Test (IFAST), Benefield Anechoic Facility (BAF), and TEMS simulator as part of the Electronic Combat Integrated Test (ECIT) complex; Edwards Flight Test Range (EFTR) which includes the real time mission control facilities, Precision Impact Range Area (PIRA) used for bombing/gunnery/infrared systems integration, personnel and cargo parachute drop zones, photo resolution range, and instrumented low level terrain following course; hydrant refueling system for heavy aircraft; aircraft weight and balance facility complex; photo/video lab for airborne and ground testing; intermediate aircraft maintenance support capability; Pacer Comet jet engine test facility; horizontal aircraft thrust stand; and aircraft gun system harmonization range (GUNBUTT); and Utah Test and Training Range (UTTR) which includes real time mission control, target areas and Air Combat and Maneuvering Instrumented (ACMI) range.

Flight Test Center
 Edwards AFB, CA 93524-1000
 (805) 277-3837

Commander: MG Richard L. Engel
 Exec. Director: Richard L. Hildebrand

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	0.000	0.000	0.000
6.3	0.000	0.000	0.000
Subtotal (S&T)	0.000	0.000	0.000
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	240.509	313.705	554.214
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	240.509	313.705	554.214
Procurement	0.000	0.000	0.000
Operations & Maintenance	10.584	20.078	30.662
Other	7.080	14.501	21.581
TOTAL FUNDING	258.173	348.284	606.457

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	53.740

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	42	166	4,025	4,233
CIVILIAN	5	538	1,835	2,378
TOTAL	47	704	5,860	6,611²

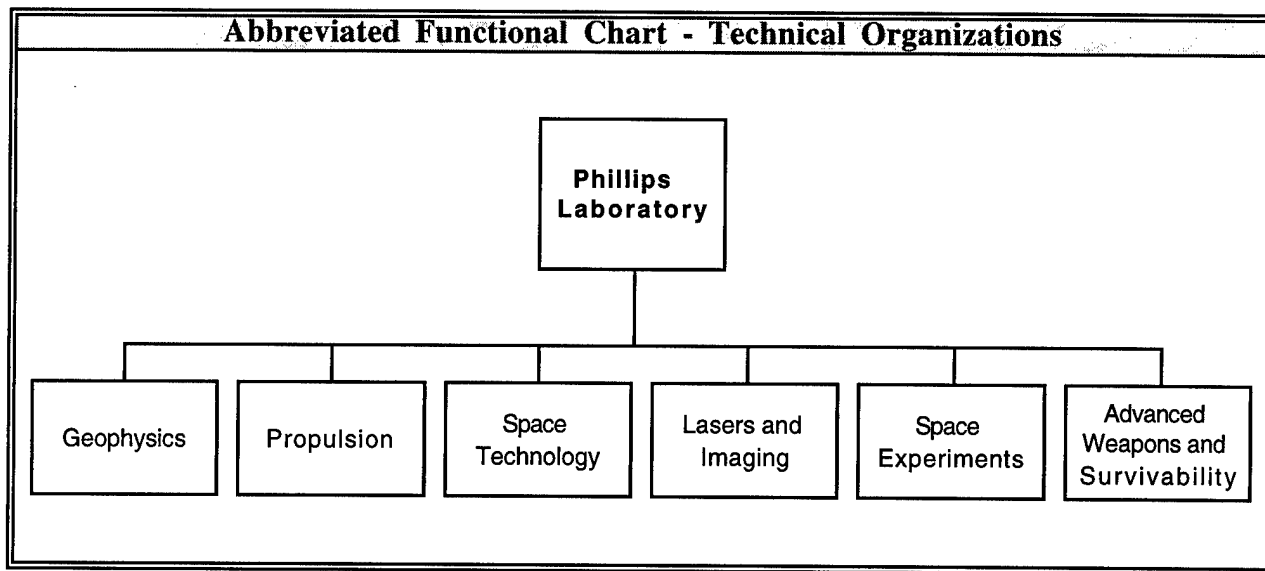
SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	297.000	REAL PROPERTY	768.624
ADMIN	315.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	8,980.000	EQUIPMENT	307.000
TOTAL	9,592.000	* NEW SCIENTIFIC & ENG. EQUIP.	0.000
ACRES	301,482	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

² Total does not include 510 Non-RDT&E Medical and Communications Personnel.

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Phillips Laboratory



Phillips Laboratory
Kirtland AFB, NM 87117-5776
(505) 846-0241

Commander: Colonel Michael L. Heil
Executive Director: Dr. R. Earl Good

MISSION

The mission of Phillips Laboratory (PL) is to advance science and technology to provide the developments and improvements needed to continue the accomplishment of the Air Force mission. PL is primarily charged with planning, organizing, directing, executing, and controlling USAF research and development in the following areas: a) Space and Missiles Technology; b) Space Experiments; c) Directed Energy Weapons, and Weapons Effects; d) Survivability; and e) Geophysics Technical Developments and Effects on Systems.

CURRENT IMPORTANT PROGRAMS

The following are some of the current important programs (thrusts) on which the laboratory is working:

- (a) Space and missiles technology focuses on spacecraft structures, power and thermal management, sensors, and electronics.
- (b) Space experiments are conducted in a ground, balloon-borne, aircraft or space mode. Also included are related ground acceptance and space/launch environmental testing.
- (c) Propulsion technology focuses on advanced concepts involving motors, propellants and test techniques. Most of this work is performed by Phillips Laboratory employees at Edwards Air Force Base.
- (d) Airborne laser technology will be able to acquire, track, and kill theater ballistic missile during their boost phase.
- (e) Lasers and imaging technology involves demonstrating the technical and engineering feasibility of lasers and imaging systems.
- (f) Advanced weapons and survivability develops high-energy plasma and microwave technologies, electromagnetic pulse hardening, space systems survivability, and advanced techniques and computer simulations for weapon effects.
- (g) Geophysics conducts research to further Air Force understanding of the environment between the Earth and Sun and its effects on systems and operations. This work is conducted by Laboratory people at Hanscom Air Force Base.

EQUIPMENT/FACILITIES

Primary operating locations are: Kirtland AFB NM, Edwards AFB CA, and Hanscom AFB MA. Unique facilities include: at Kirtland AFB, the Space Structures/Composites Laboratory, Aerospace Engineering Facility, High Energy Research and Technology Facility, High Energy Microwave Laboratory, High Energy Plasma Laboratory, Starfire optical Range, and underground tunnels in the Manzano Weapons Storage Area; at Edwards AFB, rocket test stands, Hydrodynamic Test laboratory, Chemical Experiments Laboratory, National Hover Test Facility; at Hanscom AFB, Haskell Observatory, Satellite Communications Facility, LIDAR Facility, Ionospheric Modification Laboratory, Air Force Interactive Meteorological System Laboratory, Weather Characterization & Advanced Weather System Laboratory, Cryogenic Simulation Facility, and IR Detection Facility.

Phillips Laboratory
Kirtland AFB, NM 87117-5776
(505) 846-0241

Commander: Colonel Michael L. Heil
Executive Director: Dr. R. Earl Good

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	11.044	11.633	22.677
6.2	54.030	75.852	129.882
6.3	21.249	177.704	198.953
Subtotal (S&T)	86.323	265.189	351.512
6.4	0.000	0.000	0.000
6.5	0.119	35.390	35.509
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	7.524	58.015	65.539
TOTAL RDT&E	93.966	358.594	452.560
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.746	0.000	0.746
Other	16.456	142.545	159.001
TOTAL FUNDING	111.168	501.139	612.307

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

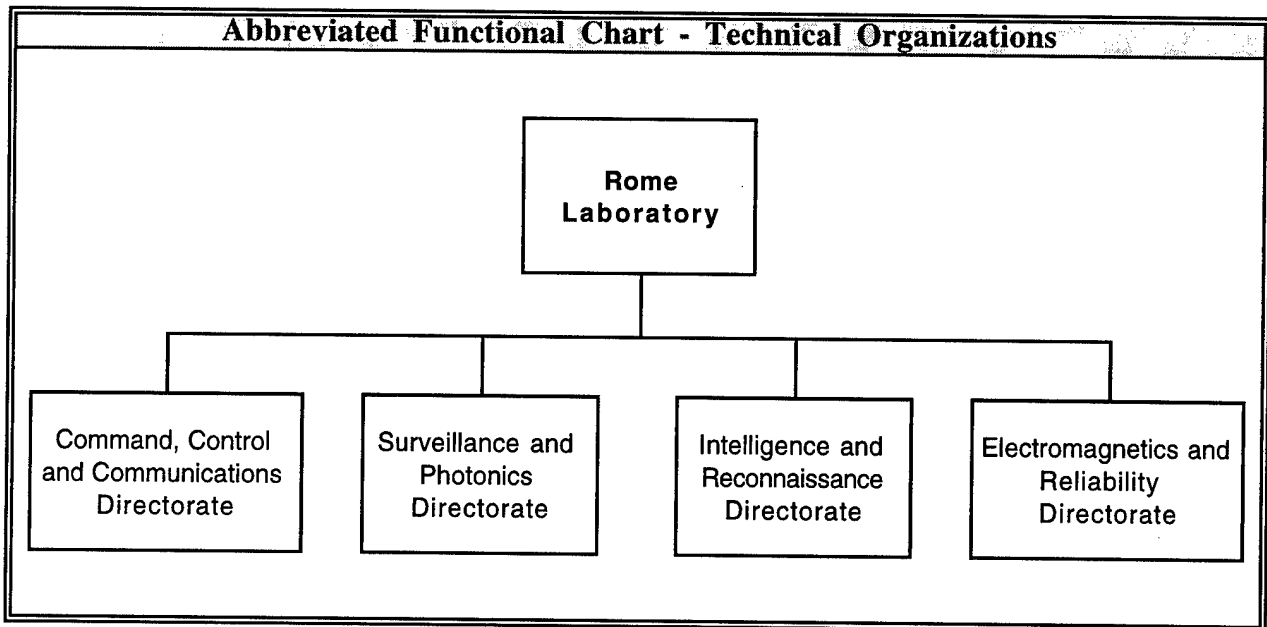
PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	45	279	234	558
CIVILIAN	229	341	610	1,180
TOTAL	274	620	844	1,738

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	996.000	REAL PROPERTY	1,051.200
ADMIN	652.000	* NEW CAPITAL EQUIPMENT	8.000
OTHER	864.000	EQUIPMENT	1,109.500
TOTAL	2,512.000	* NEW SCIENTIFIC & ENG. EQUIP.	12.000
ACRES	16,620	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

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Rome Laboratory



Rome Laboratory
Rome, NY 13441-4514
(315) 330-3053

Commander: Colonel Ted F. Bowlds
Deputy Director: Mr. Raymond P. Urtz

MISSION

Advance the state-of-the-art of science and technology in Command, Control, Communications, Computing and Intelligence (C4I) research and development and transition these technologies to meet customer needs. To achieve this, the laboratory:

- a. Conducts vigorous research, development, and test programs in all applicable technologies.
- b. Transitions technology to current and future systems to improve operational capability, readiness, and supportability.
- c. Provides a full range of technical support to Air Force Materiel Command product centers and other Air Force organizations.
- d. Conducts selected acquisition programs for low-volume, limited quantity intelligence and software systems.
- e. Promotes transfer of technology to the private sector.

Rome Lab supports this mission by developing techniques and equipment for the surveillance of ground and aerospace objects, and for inter-theater and intra-theater survivable communications. Rome Laboratory develops technologies for battle management information systems and the handling of intelligence data. The laboratory is also pursuing the following technologies: artificial intelligence/expert systems, solid state sciences and materials, electromagnetics, photonics, signal processing, computer architectures, and reliability, maintainability and compatibility of electronic systems.

CURRENT IMPORTANT PROGRAMS

The following are some of the important programs/thrusts on which the laboratory is working: Low observable surveillance, e.g., advanced signal processing and passive sensors; Secure survivable communications, e.g., joint multi-band multi-mode radio; Evolutionary Design of Complex Software; SPEAKeasy Program; Battle information management and decision aids; Defensive Planning & Execution; Data Fusion, e.g., multiple sensors/collectors; Non-cooperative target identification; Signal processing; Artificial intelligence, e.g., knowledge-based software assistant; Distributed computing technologies; Multi-level secure information systems, e.g., survivable asynchronous transfer mode (ATM); Intelligence data handling; Sensor exploitation; Photonics, e.g., optical signal processing, storage, and transmission; Intelligence processing; and Reliability of electronic components and systems.

Technology Transfer programs include: Utilizing the Education Partnership with Syracuse University to complete the market assessment of three Laboratory technologies (Indium Phosphide crystal growth, Secure Digital Voice application and Photochromatic Optical memories); ties with New York State Technology Corporation (NYSTEC) were strengthened and market assessments in the areas of Telecommunication, Law Enforcement Applications, Transportation, and Medical Applications were performed; participation in numerous technology conferences and conventions; expansion of a Patents Data Base as part of the RL World Wide Web Home Page; created a more user friendly and dynamic Technology Transfer section within the RL Home Page on the World Wide Web; participation in joint training exercises Joint Warrior Interoperability Demonstration (JWID) '96 and Global Yankee '96.

EQUIPMENT/FACILITIES

Primary operating locations are: Rome Laboratory, NY and Hanscom AFB, MA. Equipment and facilities include: Reconnaissance Exploitation facility; Photonics facility; Electronic Intelligence (ELINT) Development facility; Electronic Counter-Countermeasures (ECCM) and Signal Processing facility; Solid State Device Failure Analysis facility; Command and Control Technology Center; Communications Experimental facility; Radio Transmission facility; Electro-Magnetic Vulnerability facility; Surveillance facility; Distributed Systems Evaluation Environment facility; Space Time Adaptive Process facility; Airborne Radar Technology Development facility; Audio/Speech Processing facility; SPEAKEASY Test facility; ICARUS Prototype Development & Demonstration facility; Intelligence Support facility; Mass storage facility; Optical Beamforming facility; Integrated Photonics Characterization facility; Materials Synthesis and Development facility; Intelligence Information Processing facility; Multisensor Fusion Testbed; Experimental Device Fabrication facility; Imagery Data Base facility; Network Design facility; Distributed Systems Evaluation Environment Testbed; Software Engineering and Artificial Intelligence facility; and a variety of antenna facilities.

Rome Laboratory
 Rome, NY 13441-4514
 (315) 330-3053

Commander: Colonel Ted F. Bowlds
 Deputy Director: Mr. Raymond P. Urtz

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	5.372	12.069	17.441
6.2	59.562	94.171	153.733
6.3	9.150	103.731	112.881
Subtotal (S&T)	74.084	209.971	284.055
6.4	5.807	35.468	41.275
6.5	3.972	24.773	28.745
6.6	0.698	10.501	11.199
6.7	0.000	0.000	0.000
Non-DOD	0.127	3.289	3.416
TOTAL RDT&E	84.688	284.002	368.690
Procurement	2.619	10.957	13.576
Operations & Maintenance	9.844	84.304	94.148
Other	7.686	0.000	7.686
TOTAL FUNDING	104.837	379.263	484.100

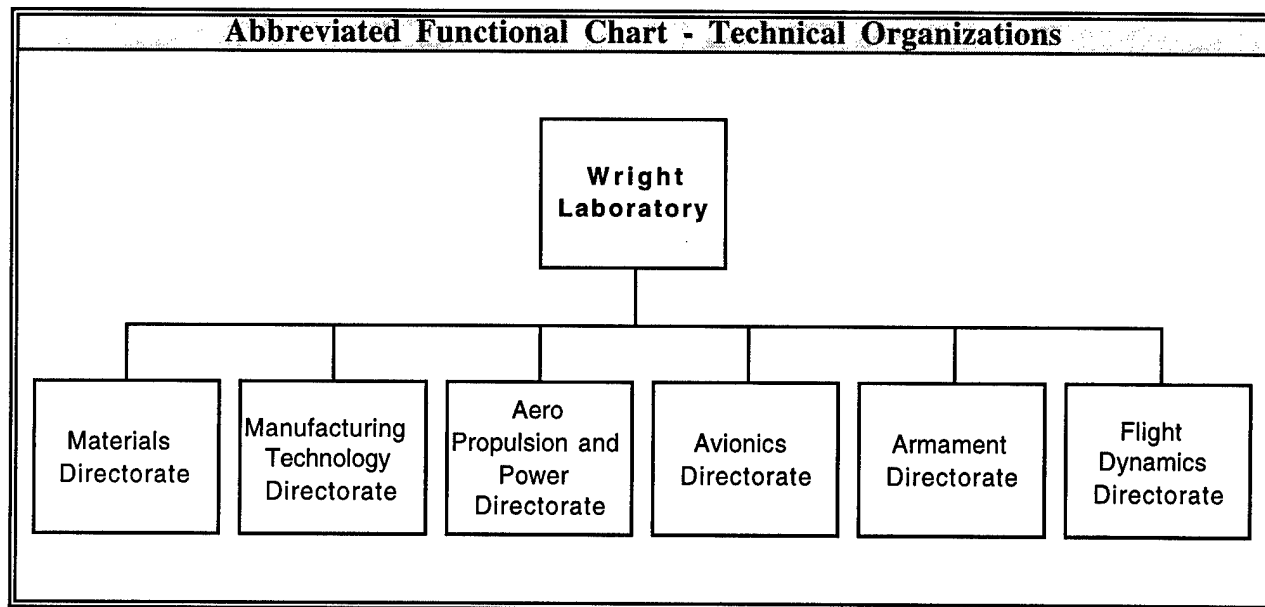
MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	7	66	55	128
CIVILIAN	79	408	449	936
TOTAL	86	474	504	1,064

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	825.000	REAL PROPERTY	65.000
ADMIN	236.000	* NEW CAPITAL EQUIPMENT	0.000
OTHER	438.000	EQUIPMENT	119.162
TOTAL	1,499.000	* NEW SCIENTIFIC & ENG. EQUIP.	22.000
ACRES	1,616	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

Wright Laboratory



Wright Laboratory
WPAFB, OH 45433-7542
(937) 255-5508

Commander: Colonel Richard W. Davis
Deputy Director: Dr. Vince J. Russo

MISSION

Lead and focus aerospace technology to meet our customer needs.

CURRENT IMPORTANT PROGRAMS

The following are some of the current important programs/thrusts on which the laboratory is working:

- Aero Propulsion and Power Technology
- Air Vehicles Technology
- Avionics Technology
- Conventional Armament Technology
- Materials Technology
- Manufacturing Technology

CRDAs to develop a user friendly program to track hazardous materials; a cost effective rehabilitation of ailing infrastructure (bridges) using composite materials; an understanding of a fire suppression system on high speed vehicles including aircraft; durable coatings on aluminum ice cube trays which has application to aircraft parts; design of a single turbo-fan engine aviation aircraft and fabricate and characterize devices using new organic nonlinear optical materials.

EQUIPMENT/FACILITIES

Primary Operating locations are: Wright-Patterson AFB OH and Eglin AFB FL. Equipment and facilities include:

- (a) Turbine Research Laboratory to simulate all relevant engine conditions governing turbine operation.
- (b) Compressor Research Facility capable of testing full-scale, multi-stage, and single shaft fans and compressors at speed/powers of 3,000 to 16,000 rpm at 3,000 hp and 16,000 to 30,000 rpm at 15,000 hp.
- (c) Kinetic Kill Vehicle Digital and Hardware-In-The-Loop Simulation Facility to realistically simulate launch-to-impact scenario for guided interceptors.
- (d) Integrated Avionics Lab for real-time dynamic testing of integrated avionics systems in realistic operational scenarios.
- (e) In-Flight Simulator to examine the flight characteristics and properties of different aircraft, different flight control systems and cockpit layouts.
- (f) Variable Stability In-Flight Simulator Test Aircraft for flight control, pilot-vehicle interface and avionics/flight control integration research programs.
- (g) Subsonic Aerodynamic Research Laboratory with Mach range from 0.2 to 5.0, for high angle of attack testing, very low turbulence, very large force measuring, and testing power-simulated vehicles.
- (h) DoD Landing Gear Development Facility for aircraft tire/wheel testing, 350 mph top speed, 150,000 to 1 lb. max load = 20 deg yaw and camber, and aircraft brakes/wheels/tire testing, 200 mph top speed, 350,000 to 1 lb. max load, 220 M ft. lbs. max energy.
- (i) Laser Hardened Materials Evaluation Lab II provides well characterized 100+ kw continuous wave, carbon dioxide laser for materials response phenomenology, geometric scaling, and sub-scale component testing.
- (j) Device Research Laboratory for extensive experimental growth and characterization of electronic and optical properties of III-V materials and devices.
- (k) Structures Test Facility with capability for static and fatigue testing of complete aerospace vehicles.
- (l) Compact Radar Cross Section Range with down range imaging capability and capability to measure small targets with accuracy.
- (m) Optical Research Facility which can measure far-field patterns of large (up to 2.4 meters in diameter) antenna systems under controlled temperatures and pressure conditions (simulate altitudes up to 270,000 feet).
- (n) Aeroballistics Research Facility which is designed to study free-flight characteristics of projectiles and missile configurations under controlled atmospheric conditions (22 +/- deg. centigrade, less than 50% relative humidity). Test range is instrumented for 207 m., 2.66 m. square cross section for first 69 m.

Wright Laboratory
WPAFB, OH 45433-7542
(937) 255-5508

Commander: Colonel Richard W. Davis
Deputy Director: Dr. Vince J. Russo

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	1.800	N/A	1.800
6.1 Other	11.100	16.400	27.500
6.2	150.300	225.200	375.500
6.3	26.000	364.700	390.700
Subtotal (S&T)	189.200	606.300	795.500
6.4	3.000	39.500	42.500
6.5	0.200	79.300	79.500
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	15.600	110.600	126.200
TOTAL RDT&E	208.000	835.700	1,043.700
Procurement	0.000	9.000	9.000
Operations & Maintenance	0.000	5.300	5.300
Other	0.000	25.000	25.000
TOTAL FUNDING	208.000	875.000	1,083.000

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	45	246	93	384
CIVILIAN	217	1,171	735	2,123
TOTAL	262	1,417	828	2,507

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	1,281.078	REAL PROPERTY	983.000
ADMIN	614.009	* NEW CAPITAL EQUIPMENT	1.200
OTHER	690.976	EQUIPMENT	2,095.190
TOTAL	2,586.063	* NEW SCIENTIFIC & ENG. EQUIP.	13.900
ACRES	1,240	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

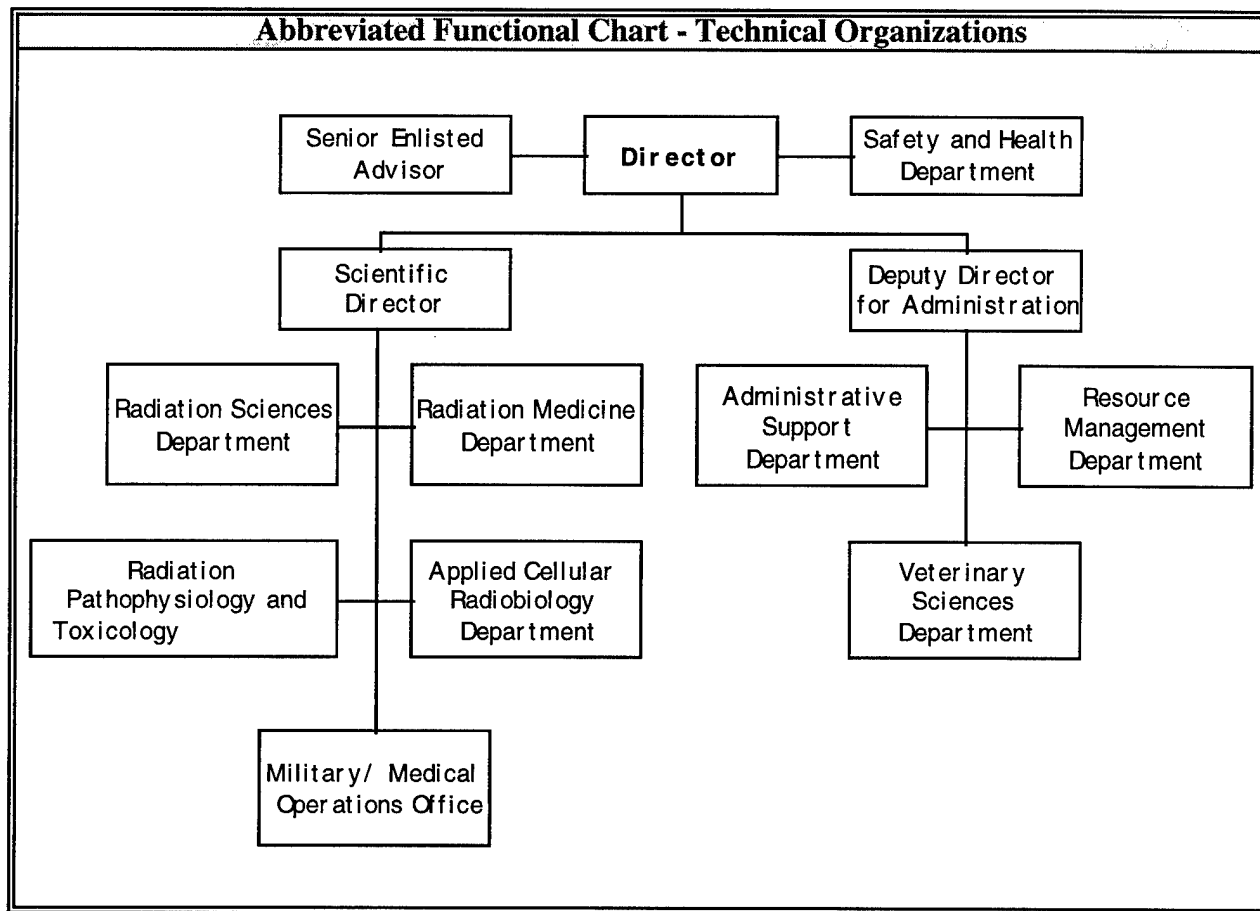
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**UNIFORMED SERVICES
UNIVERSITY OF
THE HEALTH SCIENCES**

**UNIFORMED SERVICES UNIVERSITY of the HEALTH SCIENCES
(USUHS)**

The only In-House RDT&E Activity within USUHS is the Armed Forces Radiobiology Research Institute (AFRRI).

Armed Forces Radiobiology Research Institute



Armed Forces Radiobiology Research Institute
Bethesda, MD 20889-5603
(301) 295-1210

Dir.: Captain Eric E. Kearsley, USN
Scientific Dir.: Dr. E. John Ainsworth

MISSION

The mission of Armed Forces Radiobiology Research Institute shall be to conduct research in the field of radiobiology and related matters essential to the operational and medical support of the Department of Defense and military services.

CURRENT IMPORTANT PROGRAMS

Develop medical countermeasures to treat radiation injuries.

Optimize combinations of protective agents to promote survival and combat effectiveness following irradiation at high or low dose rates.

Development of reliable biodosimetry assays/techniques.

Evaluation of early and late effects of radiation exposures at low dose rates.

Counterproliferation of weapons of mass destruction.

Impact of imbedded depleted uranium shrapnel on biological systems.

Continue to support studies of residents of the former Soviet Union who were exposed to chronic radiation through environmental contamination.

EQUIPMENT/FACILITIES

Functions: operate facilities for conducting radiobiology research and disseminating results; conduct advanced training; provide analysis consultation on bioeffects of radiation; and perform such other research functions as required. Major equipment includes: pulse and steady state nuclear reactor, 100,000-Curie Cobalt-60 irradiator, electron linear accelerator, steady state X-ray source, and electron microscope. Support services include: measurement of radiation fields, provision and care of laboratory animals, equipment design and fabrication assistance, real-time data acquisition system, television and film documentation of experiments, personnel and environmental monitoring, editorial assistance in report preparation, and a large technical library.

Armed Forces Radiobiology Research Institute
Bethesda, MD 20889-5603
(301) 295-1210

Dir.: Captain Eric E. Kearsley, USN
Scientific Dir.: Dr. E. John Ainsworth

FY96 FUNDING DATA (MILLIONS \$)			
APPROPRIATION	IN-HOUSE	OUT-OF-HOUSE	TOTAL
RDT&E:			
6.1 ILIR	0.000	N/A	0.000
6.1 Other	0.000	0.000	0.000
6.2	6.937	0.213	7.150
6.3	3.899	0.000	3.899
Subtotal (S&T)	10.836	0.213	11.049
6.4	0.000	0.000	0.000
6.5	0.000	0.000	0.000
6.6	0.000	0.000	0.000
6.7	0.000	0.000	0.000
Non-DOD	0.000	0.000	0.000
TOTAL RDT&E	10.836	0.213	11.049
Procurement	0.000	0.000	0.000
Operations & Maintenance	0.000	0.000	0.000
Other	1.400	0.000	1.400
TOTAL FUNDING	12.236	0.213	12.449

MILITARY CONSTRUCTION (MILLIONS \$)	
Military Construction (MILCON)	0.000

PERSONNEL DATA (END OF FISCAL YEAR 1996)				
TYPE	SCIENTISTS & ENGINEERS		TECHNICAL SUPPORT & OTHER PERSONNEL	END STRENGTH
	PHD'S	OTHER		
MILITARY	14	26	16	56
CIVILIAN	28	26	47	101
TOTAL	42	52	63	157

SPACE AND PROPERTY			
BUILDING SPACE (THOUSANDS OF SQ FT)		PROPERTY ACQUISITION COST (MILLIONS \$)	
LAB	61.750	REAL PROPERTY	15.000
ADMIN	34.257	* NEW CAPITAL EQUIPMENT	0.700
OTHER	23.908	EQUIPMENT	13.000
TOTAL	119.915	* NEW SCIENTIFIC & ENG. EQUIP.	0.080
ACRES	10	* Subset of previous category. See Equip./Facilities Narrative.	

NA = Not Applicable

APPENDICES

APPENDIX A
DISESTABLISHMENT, ESTABLISHMENT,
OR CHANGE IN ORGANIZATION NAME

APPENDIX A

**DISESTABLISHMENT, ESTABLISHMENT,
OR CHANGES IN ORGANIZATION NAME
BETWEEN FY95 AND FY96**

DEPARTMENT OF THE ARMY

The **Army Biomedical Research & Development Laboratory** has been consolidated under the **Medical Research Institute of Environmental Medicine**.

DEPARTMENT OF THE NAVY

No changes.

DEPARTMENT OF THE AIR FORCE

The **46th Test Group** has been consolidated under the **Development Test Center**.

DEPARTMENT OF DEFENSE AGENCIES

No changes.

Note: Activities in **bold typeface** were reported in the FY 95 edition of this report as separate Activities.

APPENDIX A

**DISESTABLISHMENT, ESTABLISHMENT,
OR CHANGES IN ORGANIZATION NAME
BETWEEN FY95 AND FY96**

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APPENDIX B

DEFINITIONS OF REPORT ELEMENTS

APPENDIX B DEFINITIONS OF REPORT ELEMENTS

INTRODUCTORY PRECAUTIONARY NOTE

Data in this report should not be summarized or used for comparative analyses between Activities and/or across Services because labs/centers use different business systems to satisfy their special needs. Some organizations (e.g., Navy) operate on an industrial funding basis; that is, they charge their customers for all operating costs, including maintaining their physical plants and providing other necessary support services (e.g., human resources office, finance and accounting support). Other labs/centers (e.g., Air Force) are institutionally funded; that is, they receive most of their funding as direct appropriations from Congress and use these funds for operating support costs as well as for research. In addition, most institutionally funded labs/centers are tenants on larger military bases and receive their support services at reduced or no charge from their host. Even those that own their own facilities receive separate funding support services and do not charge their customers for these overhead costs. Efforts are underway to institute common business practices across the DOD RDT&E labs, but until that occurs comparisons may be misleading.

DEFINITIONS

Note: In FY92 and previous years a different numbering scheme was used to label budget activity categories.

6.1 ILIR - This is the total obligation authority for In-House Laboratory Independent Research 6.1 program elements (Navy PE=0601152N).

6.1 Other In-House/Out-of-House - This is the total obligation authority for Basic Research 6.1 program elements conducted In-House (excluding ILIR) or Out-of-House

6.2 Other In-House/Out-of-House - This is the total obligation Authority for Exploratory Development/Applied Research 6.2 program elements conducted In-House/Out-of-House.

6.3 In-House/Out-of-House - This is the total obligation authority for Advanced Development 6.3 program elements conducted In-House/Out-of-House.

6.4 In-House/Out-of-House - This is the total obligation authority for Demonstration and Validation (Dem/Val) 6.4 program elements conducted In-House/Out-of-House.

6.5 In-House/Out-of-House - This is the total obligation authority for Engineering and Manufacturing Development (EMD) 6.5 program elements conducted In-House/Out-of-House.

6.6 In-House/Out-of-House - This is the total obligation authority for RDT&E Management Support 6.6 program elements conducted In-House/Out-of-House.

6.7 In-House/Out-of-House - This is the total obligation authority for all Operational Systems Development (OSD) 6.7 with RDT&E funds conducted In-House/Out-of-House. This item is interpreted in its broadest sense to include operational developments outside the systems areas, and not included in any of the above categories.

Acres - This is the total number of acres owned combined with the total numbers occupied. Included is land which is public domain. In cases involving tenants who are also RDT&E Activities, the tenants will have indicated only the acreage occupied solely by them. The owning Activity will account for the remainder including any acreage occupied by non-R&D tenants. This amount excludes all easements and permits, and is rounded to the nearest acre.

APPENDIX B DEFINITIONS OF REPORT ELEMENTS

End Strength, Military/Civilian - This is the total number of military personnel assigned to the reporting organization as of the last day of the fiscal reporting period (Officers, Warrant Officers, and Enlisted) and the total number of civilians filling authorized positions in the reporting organization as of the last day of the fiscal reporting period (including direct hire foreign nationals and co-ops). Summer hires, student aids, indirect hire foreign nationals, and patients are excluded.

Equipment - Property Acquisition Cost - This is the total acquisition cost of all "personal property" equipment, which includes the cost of installed equipment directly related to mission execution, such as lab test equipment. This total includes the acquisition cost of new scientific and engineering equipment. Each reporting Activity is responsible for reporting this information for those facilities assigned to, leased by, or occupied and utilized by it. An RDT&E owner does not report this information for the facilities assigned to or occupied by its RDT&E tenants, as they must report this information separately.

Note: Installed equipment reported under **Real Property - Property Acquisition Cost** is not included here.

In-House Obligations - Obligations reported under this category are for activities directly performed, or to be performed, by government personnel of the reporting organization. In addition to personnel costs, also included under In-House are the costs of supplies and equipment essentially of an off-the-shelf nature that are procured for In-House research and development, plus such things as travel, publications, and other types of services in support of In-House functions.

Except for the Navy, personnel expenses for planning and administering contracts and grants for Out-of-House work are generally excluded from the In-House entity total. For Navy Activities, In-House includes all direct (i.e., customer-funded, mission-oriented) labor, direct material, direct travel, equipment, direct computer support, other direct support services, and all overhead.

In-House RDT&E Activities - These Activities are organizational entities which perform at least 25% of their work in any or all of the categories of research, development, test and evaluation (RDT&E). In addition, at least 25% of an Activity's In-House manpower and/or 25% of the obligation authority used In-House is devoted to one or more of the categories of RDT&E.

MILCON - This is the total obligation authority for Military Construction appropriations.

New Capital Equipment - Property Acquisition Cost - This is the total acquisition cost for new capital equipment (i.e., installed physical plant equipment such as HVAC) acquired in FY96. This amount is also included in the total entry for **Real Property - Property Acquisition Cost**.

New Scientific & Engineering Equipment - Property Acquisition Cost - This is the total acquisition cost for new scientific and engineering equipment acquired in FY96, including the cost of newly installed equipment directly related to mission execution, such as lab test equipment. This amount is also included in the total entry for **Equipment - Property Acquisition Cost**.

Non-DOD In-House/Out-of-House - This is total obligation authority for all RDT&E In-House/Out-of-House not reported under 6.1-6.7, as defined above, including non-Defense funds for work which is conducted In-house/Out-of-House.

Obligation Authority - Authority for the financial resources available for obligation in the specific year being reported. This includes unobligated authority carried forward from the prior year and all obligation authority received or made available for obligation in the year being reported, including the unobligated authority which will be carried forward into the following year.

APPENDIX B DEFINITIONS OF REPORT ELEMENTS

O&M/Operations & Maintenance In-House/Out-of-House - This is the total obligation authority for Operations and Maintenance appropriations In-House/Out-of-House, regardless of source.

Other In-House/Out-of-House - This is the total obligation authority for all "other" (i.e., not reported elsewhere) appropriations In-House/Out-of-House, regardless of source.

Out-Of-House Obligations - Obligations reported under this category are for direct mission-oriented work performed, or to be performed, by other than the organizational entity. Out-of-House performers may include other departmental or DOD organizational entities, industrial firms, educational institutions, not-for-profit institutions, and private individuals. Included as Out-of-House work are all expenses paid the Out-of-House performers.

Except for the Navy, the expenses incurred in planning and administering Out-of-House programs by personnel of the organizational entity are generally also included in Out-of-House. This would also include travel and other supporting services. For Navy Activities, Out-of-House includes only direct (i.e., customer-funded, mission-oriented) work performed by other than the reporting organizational entity. All overhead is also excluded from this category by the Navy.

Procurement In-House/Out-of-House - This is the total obligation authority for procurement appropriations In-House/Out-of-House regardless of source.

RDT&E - The sum of the total obligation authority, regardless of source, for both In-House and Out-of-House funding for the following categories:

- ILIR 6.1
- Basic Research 6.1
- Exploratory Development/Applied Research 6.2
- Advanced Development 6.3
- Demonstration and Validation (Dem/Val) 6.4
- Engineering and Manufacturing Development (EMD) 6.5
- RDT&E Management Support 6.6
- Operational Systems Development 6.7
- Non-DOD

Real Property - Property Acquisition Cost - This is the total acquisition cost of all land, buildings and capital equipment, including the cost of installed physical plant equipment such as HVAC and improvements. This total includes the acquisition cost of new capital equipment. Each reporting Activity is responsible for reporting this information for those facilities assigned to, or leased or occupied by it. An R&D owner will not report this information for the facilities assigned to or occupied by its R&D tenants, as they must report this information separately. This total does not include acreage or real property in buildings rented from private owners.

Scientists and Engineers (S&E) - This generally includes full-time professional Government scientific and engineering civilian personnel actively engaged in RDT&E activities. It also includes military professionals, both officer and enlisted, actively engaged in RDT&E activities. Lawyers, accountants, chaplains, social workers, and educators should be excluded.

PhD's, Military/Civilian - This is the total number of military (officer and enlisted) and civilian **scientists and engineers** whose most advanced degree is a doctorate. Degrees must be earned from an accredited college or university. Honorary degrees are excluded.

Other, Military/Civilian - This is the total number of military (officer and enlisted) and civilian **scientists and engineers** who do not hold a doctorate degree, but who are considered

APPENDIX B DEFINITIONS OF REPORT ELEMENTS

professionals. Professionals include full-time Government scientific and engineering personnel actively engaged in RDTE activities. Lawyers, accountants, chaplains, social workers and educators are excluded.

Space, Admin - This is the total number of square feet of building space determined to be administrative space (usually that portion occupied by the headquarters and support services staff and excludes scientists', or engineers' offices in a laboratory which should be reported as Laboratory space). Each reporting Activity is responsible for reporting this information for those facilities assigned to, or leased, or occupied by it.

Space, Lab - This is the total number of square feet of permanent and semi-permanent (e.g., fixed-site trailers) walled and roofed building space, determined to be laboratory space. Excluded are parking lots, open storage areas, and lean-tos. Each reporting Activity is responsible for reporting this information for those facilities assigned to, or leased, or occupied by it.

Space, Other - This is the total number of square feet of all remaining building space (e.g., hangars, warehouses, garages, etc.). Each reporting Activity is responsible for reporting this information for those facilities assigned to, leased, or occupied by it.

Technical Support and Other Personnel - This generally includes non-professionals working on an RDT&E project or program in support of a professional. In the case of civilians, it includes, but is not limited to, those holding positions that fall into the Civil Service Occupational Groups and Series of Classes, General Schedule. This grouping also includes professional, administrative and clerical personnel in Federal General Schedule (GS) and Wage Grade (WG) positions who provide support services in such areas as computers, personnel, technical library, logistics, and facilities.

Total Funding - The sum of Total RDT&E, Procurement, Operations & Maintenance and Other.

APPENDIX C
SELECTED STANDARD ABBREVIATIONS
AND ACRONYMS

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ACTD	-	Advanced Concept and Technology Demonstration
AI	-	Artificial Intelligence
ASW	-	Antisubmarine Warfare
ATCCS	-	Army Tactical Command and Control System
ATD	-	Advanced Technology Demonstration
BW	-	Biological Warfare
C2	-	Command and Control
C4I	-	Command, Control, Communications, Computers, and Intelligence
CAD	-	Computer Aided Design
CAE	-	Computer Aided Engineering
CAM	-	Computer Aided Manufacturing
CB	-	Chemical Biological
CBR	-	Chemical, Biological, Radiological
CG	-	Commanding General
CINC	-	Commander in Chief
CM	-	Countermeasures
CNO	-	Chief of Naval Operations
CONUS	-	Continental United States
CRADA	-	Cooperative Research and Development Agreement
CW	-	Chemical Warfare
DA	-	Department of the Army
DOD	-	Department of Defense
DON	-	Department of the Navy
DREN	-	Defense Research and Engineering Network
DTAP	-	Defense Technology Area Plan
E3	-	Electromagnetic Environmental Effects
ECCM	-	Electronic Counter-Countermeasures
ECM	-	Electronic Countermeasures
ELINT	-	Electronic Intelligence
EMI	-	Electromagnetic Interference
EMP	-	Electromagnetic Propagation
EMV	-	Electromagnetic Vulnerability
EMW	-	Electromagnetic Warfare
EOD	-	Explosive Ordnance Disposal
EW	-	Electronic Warfare
GPS	-	Global Positioning System
HF	-	High-Frequency
HPCMP	-	High Performance Computing Modernization Program
HPM	-	High Powered Microwaves
HVAC	-	Heating, Ventilation, and Air Conditioning
IAC	-	Information Analysis Center
IEW	-	Intelligence Electronic Warfare
IFF	-	Identification, Friend or Foe
ILIR	-	In-Lab Innovative Research
IR	-	Infrared
IR&D	-	Independent Research and Development
KE	-	Kinetic Energy
M&S	-	Modeling and Simulation
MRTFB	-	Major Range and Test Facility Base
MSRC	-	Major Shared Resource Center
NBC	-	Nuclear, Biological and Chemical
NVD	-	Night Vision Devices
OCONUS	-	Outside the Continental United States
OMA	-	Operations and Maintenance

APPENDIX C
SELECTED STANDARD ABBREVIATIONS AND ACRONYMS

PEO	-	Program Executive Officer
PM	-	Program Manager
POL	-	Petroleum, Oil, Lubricants
R&D	-	Research and Development
RDT&E	-	Research, Development, Test and Evaluation
RF	-	Radio Frequency
S&T	-	Science and Technology
SBIR	-	Small Business Innovation Research
STO	-	Science and Technology Objective
T&E	-	Test and Evaluation
TF XXI	-	Task Force XXI
UAV	-	Unmanned Aerial Vehicle
USW	-	Undersea Warfare
UUV	-	Unmanned Undersea Vehicle
UV	-	Ultraviolet